NOVEMBER 1955

NEWEST TECHNIQUE

Universal Maintenance Standards

. . . p. 98

FACTORY

MANAGEMENT AND MAINTENANCE

QUALITY CONTROL

New Way to Speed Inspection

. . . p. 88

WORKER EFFICIENCY

Fitting Eyesight to Job Needs

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You Will Be Using More D-C

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COMPLETE CONTENTS, PAGE 2

ON PAGE 152

BAKER announces a NEW LINE of BATTERY-POWERED FORK TRUCKS

with many added features...

Capacities to 6000 pounds

- **EASIER TO STEER**—Less weight on steering axle, combined with automotive type steer, provides finger-tip control even on largest models.
- **MORE CONVENIENT CONTROLS**—Located right where operator wants them. Easy and simple to actuate.
- **FULL VISIBILITY**—No cowl, no console—no "neck craning." Greater safety, less operator fatigue, more work.
- **EASIER TO GET ON OR OFF**—Absence of cowl and other obstructions means easier and faster mounting and dismounting.
- **DYNAMIC BRAKING**—Greater safety on ramps, smoother stops, less wear on brake lining, greater protection for truck and load.
- **SEPARATE PARKING BRAKE LINKED TO DRIVER'S SEAT.** Automatically holds truck when driver dismounts—even on incline. On armature shaft—independent of wheel brakes.
- **HYDRAULIC WHEEL BRAKES**—Finest available. Self-energizing, self-equalizing. Single point adjustment.
- **STRONGER STEERING AXLE**—Double-yoke construction and rubber mounting reduces road shocks and means smoother riding for operator and load.

The new Baker FT line of electric fork trucks is engineered for maximum efficiency, operating convenience and economy, with minimum maintenance and down time. Reliable Timken axle is specially designed for industrial truck use. Less overhang, lighter weight, greater stability, shorter turning radius, more forward tilt and lower silhouette are advantages gained in this new design.

Every Baker "FT" has a *full one year warranty*—proof of our confidence in our workmanship and quality. Elements that have built the outstanding reputation for previous Baker electric trucks have been retained, and new features added. Ideal placement of hydraulic valves makes it simple to add additional valves for hydraulic attachments. All service points are conveniently accessible.

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Baker®
handling equipment

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1218 WEST 80th STREET • CLEVELAND 2, OHIO

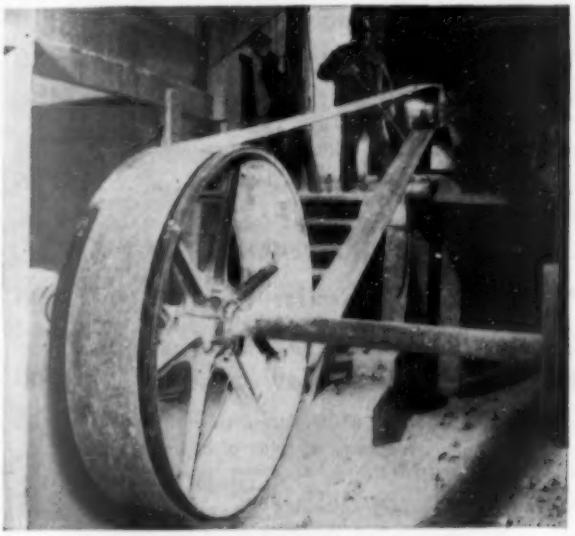
A subsidiary of Otis Elevator Company

5E4

B. F. Goodrich COST REDUCTIONS WITH RUBBER

Where rubber hose outlasts flexible metal pipe 5 to 1

At this Connecticut plant, they used the best flexible metal pipe to unload quicklime from a freight car. But the sharp, destructive quicklime wore and ate through the pipe in a few weeks. Then B. F. Goodrich hose, with a special tough rubber lining, was tried. It lasts five times as long as the more expensive metal, and is easier to handle from railroad car to storage because it's much more flexible.



Transmission belt saves 3 ways by lasting twice as long

Just by changing to a B. F. Goodrich "Drivesall" belt, the owner of this plant has saved the cost of one new belt because the B. F. Goodrich belt, made with rayon fabric, has already lasted twice as long as any belt ever used before. With 50% less stretch, fewer take-ups are needed, so maintenance costs are down, too. And the owner reports the third saving is in production costs because the mill now runs with fewer shutdowns.

Steep angle conveyor belt increases stacking height 40%

With an improved kind of package-handling conveyor belt —B. F. Goodrich Ribflex—this California warehouse now stacks 42 sugar bags where 30 were the limit before. It climbs at a steep 45° angle, carries twice as many sacks at a time. The higher incline angles made possible by the Ribflex belt can make substantial savings in conveyor lengths and floor space. For example, by increasing the incline angle from 30° to 45°, a 29% shorter conveyor can be used, 42% less floor space is needed.

THESE actual cases are typical of thousands where improved B. F. Goodrich products have saved money by lasting longer or doing jobs other materials couldn't do. The cost of anything, of course, is its price divided by the length of service it delivers. Buying for long service is the only businesslike way to buy anything and that is why B. F. Goodrich products cost so much less.

The time saved in buying, handling and repairs, is an extra B. F. Goodrich dividend you get when you call your B. F. Goodrich distributor for rubber products. *The B. F. Goodrich Co., Dept. M-490, Akron 18, Ohio.*

B. F. Goodrich
INDUSTRIAL PRODUCTS DIVISION

FACTORY Reader's

MANAGEMENT AND MAINTENANCE

SPECIAL REPORTS

Universal Maintenance Standards 98
New low-cost way to figure time standards you can live with. A FACTORY "first" fresh from Methods Engineering Council.

How You Can Get Better Water 128

PRODUCTION

Teaming Up Trucks and Conveyors 84
Here's a dandy solution to a handling problem. It squeezes the water out of costs, boosts production as well as safety.

Better Handling for Small Parts 87

Inspecting Six Times Faster 88

Boosting Output 200-500% 96

Scheduling by Computer 103
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Three Ways to Painting Payoff 110

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THE MAGAZINE OF PLANT MANAGEMENT FOR 64 YEARS

A McGRAW-HILL PUBLICATION

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FACTORY MANAGEMENT AND MAINTENANCE
NOVEMBER 1955 Vol. 113, No. 11

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FACTORY | LETTERS

METHODS INCENTIVES

Sir:

I have read with interest the article entitled "New Look at Methods Incentives" (FACTORY, August 1955, p. 90) . . . It pointed out how the operator is rewarded for a better method that he devises to lower the standard But I would appreciate knowing the answer to the following:

1. What arrangement is suggested where one operator makes a suggestion or devises a method that reduces the standard on another operator's job? Does the reward go to the suggester, or to the operator whose job is improved, or is a split recommended?

2. What is suggested about improvements coming from foremen or supervisors to reduce standard time on a job in their own or any other departments?

3. What about ideas from plant maintenance men, mechanics, etc.?

4. If the standard is decreased because management installs better, more efficient machinery, is an award made to anyone?

W C Pattillo
Plant Manager
Southern Saw Service, Atlanta

► **W. W. Taylor, author of the article, replies as follows:**

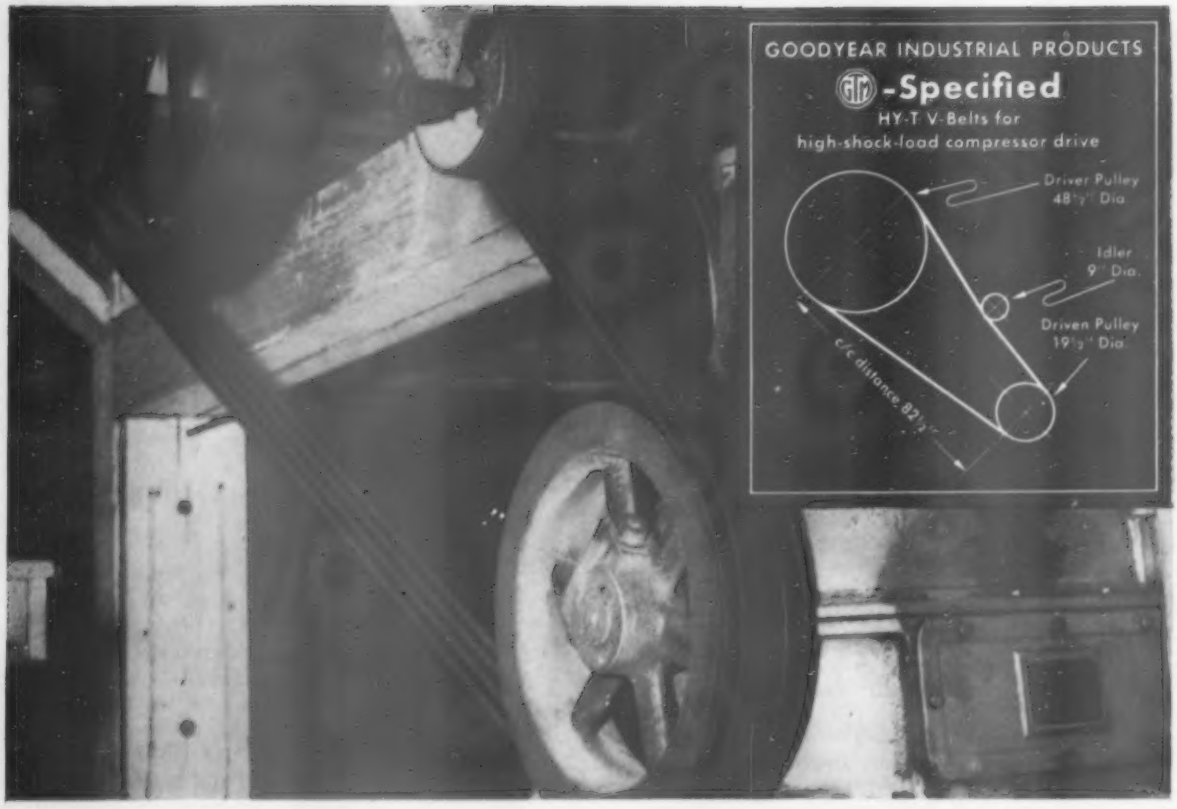
"1. An award to the suggester. Since the other operator has contributed nothing, there seems to be no good reason for an award.

"2. Methods incentives apply to operators on measured daywork only, not to management personnel.

"3. If they're on measured daywork, methods incentives will apply.

"4. No award would be paid to any-

Turn to page 8



Saved the cost of 3 sets of belts

and still going strong on tough compressor drive

BELT-BREAKING problem for a Southern lumber company was overloading on a compressor drive. Frequent and sudden shock-loads kept belt-life down to 6 months, meant costly shutdowns and expensive replacements.

Called in for consultation, the G.T.M.—Goodyear Technical Man—recommended HY-T V-Belts. Their multiple plies of chemically produced 3-T CORD are tempered by Time, Tension and Temperature to eliminate surplus stretch. They can carry 40% greater horsepower loads at speeds from 100 to 6,000 f.p.m.—have maximum resistance to oil, moisture, mildew and static generation.

Result: The HY-T V-Belts easily took the shock-loads in stride, are still running after 24 months—4 times the service life of the standard V-belts they replaced—saving the cost of 3 sets of belts to date.

If you have drive troubles call in the G.T.M.—the man who knows V-belts best. Contact him through your Goodyear Distributor or by writing to:

Goodyear, Lincoln, Nebraska or Akron 16, Ohio

YOUR GOODYEAR DISTRIBUTOR *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

Hy-T—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

HY-T V-BELTS with 3-T CORD by

GOODYEAR

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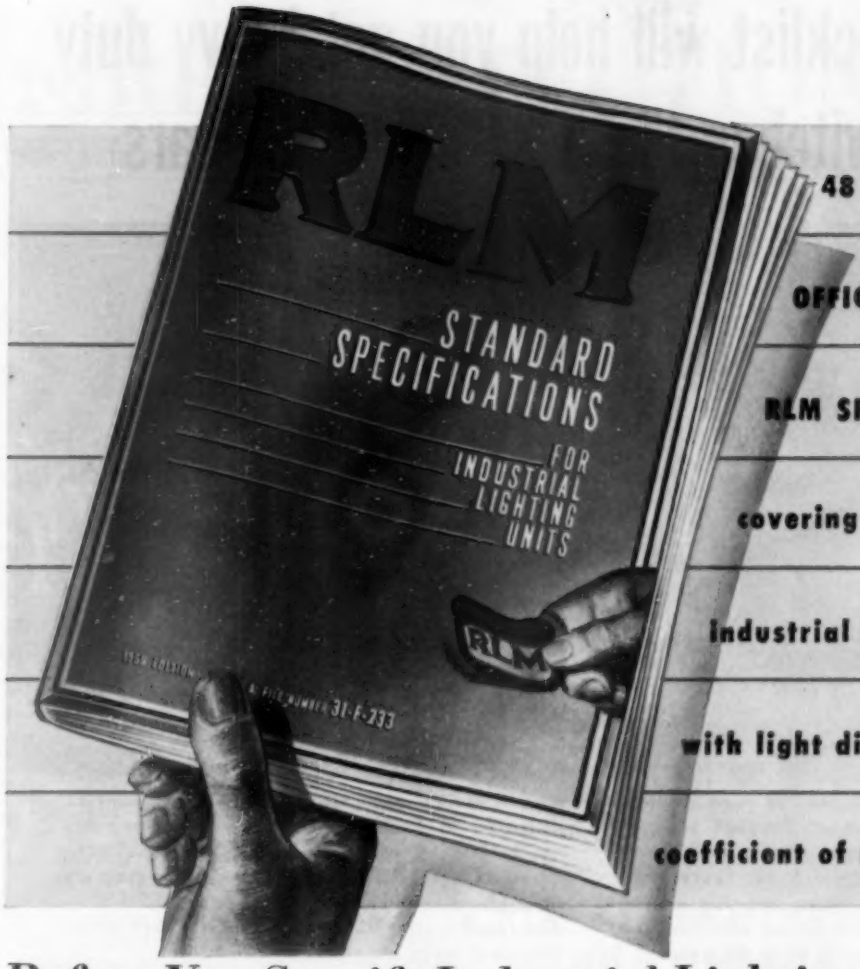

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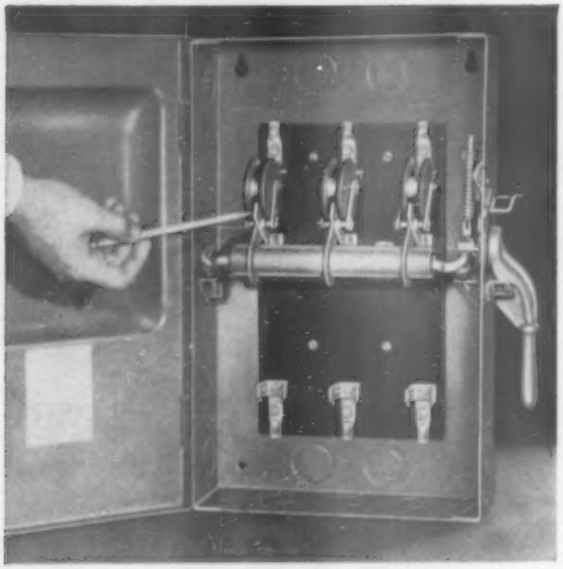
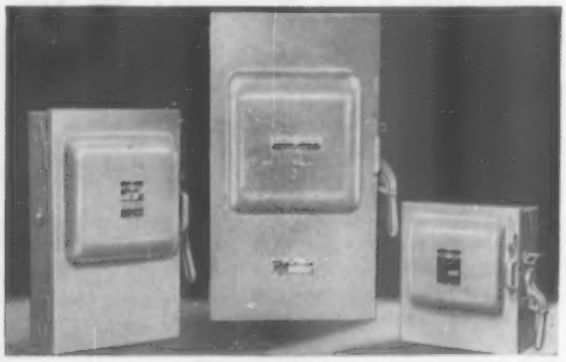
This G-E checklist will help you get heavy duty safety switches that last up to 30 years



1. Have they proved themselves in years of tough service? Industry reports show that many Trumbull Style A heavy duty switches have given reliable service for over 30 years. Reasons? Such features as the heavy steel operating yoke that resist breaking and that insures opening and closing the switch. Strong fibre crossbar covers the yoke, maintains perfect blade alignment.

2. Will they operate coolly, efficiently? The impact-resistant slate base on Trumbull heavy duty safety switches rapidly bleeds off heat, so temperatures won't build up to dangerous levels. All copper current carrying parts are silver plated to eliminate oxidation and to further reduce temperatures. Maximum current is always carried because of heavy jaw pressures, sure fit.



3. Are they quality made of rugged materials? Every Trumbull switch is made under severe quality control conditions using carefully selected materials. Hinge and jaw posts are milled, sweated and pinned (Type A construction) to stand up under tough abuse. Yoke bumpers eliminate jarring and the handle is of cast iron construction.

4. Can your plant standardize on them? Complete range of selection for every switch application makes it easy for your plant to standardize on Trumbull Style A heavy duty switches. Common parts, similar maintenance procedures reduce costs, electricians' time. Rated from 30 to 1200 amps and up to 600 volts. Single and double throw operation, 2, 3 or 4 pole design, either fusible or no fuse.

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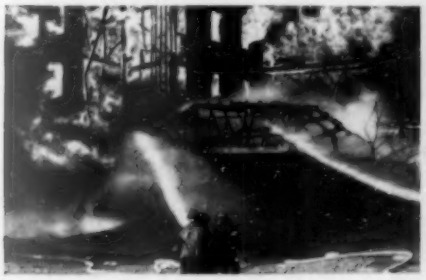
GENERAL ELECTRIC

FIRE PROTECTION NEWS

NO. 1 IN A SERIES, PUBLISHED BY GRINNELL COMPANY, INC., PROVIDENCE, R. I.

Fire Razes Factory



Flames leveled two factories and several other buildings, despite valiant efforts of firemen to check the blaze. Damage was estimated in the hundreds of thousands of dollars. Several people were seriously injured. Another case of the high cost of NO SPRINKLERS.

313 Fires Cause $202 Millions of Damage

Last year hit a new, all-time high for "large loss" fires, those that exceed $250,000. A total of 313 big fires were reported in the United States and Canada. Most of the increase in the number of fires occurred in the mercantile classification, which jumped from 29 fires in 1953 to 54 last year. Warehouse and other storage areas rose from 48 to 54 and the transportation section climbed from 39 to 57. In commenting on the large fire loss, National Fire Protection Association said: — "Most of the large loss building fires in 1954 would not have occurred had the buildings been completely protected by a properly installed and maintained sprinkler system. The value of a complete sprinkler system is certainly obvious."

Chemical Plant at Height of the Fire

This is the way the Arnold Hoffman Chemical Plant in Dighton, Mass. looked while a fire "raged" inside. The fire, however, never amounted to much, because a Grinnell Automatic Sprinkler System went into operation, snuffing out the fire instantly. Damage was negligible and no one was injured.

FIRE PROTECTION IS GOOD BUSINESS

E. J. Meyers, Assistant Manager, Safety and Fire Protection Division, E. I. du Pont de Nemours & Company, gives his formula for safe plant design

Speaking before the Massachusetts Institute of Technology's Conference on Fire Protection Engineering, Mr. Meyers expressed some basic facts which deserve a wider audience. Excerpts from this speech follow:

"Fire protection has always been an important part of good business . . . fire protection begins with the design of the plant — buildings, equipment and processes. The object is to remove, as far as possible, the human factor by making protection permanent or automatic.

". . . In the minds of many, fire prevention and fire protection are confined largely to care in preventing or safe-guarding the common causes of fire, such as the use of matches, smoking, spontaneous combustion of oily rags, and of defects existing in lighting. To be effective, however, every factor affecting safety to either life or property must be included.

". . . The automatic sprinkler system is undoubtedly the most extensively used fire protection device. This is mainly due to the fact that it is automatic in action and always on the job in any part of the property equipped, provided it is properly installed and maintained. It prevents destruction of property, interruption to operations, and the loss of lives. A majority of fires are small at the start and can usually be put out with a small amount of water. The sprinkler automatically supplies this water at the needed time without the aid of human agency, provided it is a standard installation properly maintained and backed up with adequate water."

GRINNELL PROTECTOSPRAY SYSTEM COOLS OFF LP-GAS TANK CAR

This tank car full of liquefied petroleum gas is at a siding where its contents will be transferred to industrial storage tanks. Any leak brings the chance of fire, in which case the Grinnell ProtectoSpray System operates in the following manner:

The drenching water blanket provides instant cooling, to reduce internal tank pressures and to prevent rupture. Positive air turbulence is created, even in still air, to help dilution of leaking gas by the inert gases present in the air. Water-vapor dilution assists in thinning out gas-air mixtures toward the point where they will no longer burn. And fire, if it occurs, is localized, permitting safe disposal of the gas by burning where it escapes, thus reducing the fire-explosion hazards downwind or downgrade.

Grinnell Automatic Fire Protection Systems are the result of more than three quarters of a century of continuous research and development. Grinnell ProtectoSpray is just one of the many systems engineered to protect special hazards. Water spray, air foam, carbon dioxide, and dry powder systems are available to protect all classes of hazards.

one, unless the installation was brought about by a suggestion eligible for an award. Since the company has to foot the bill for the machinery, the cost of this will reduce the savings out of which an award can be paid."—ED.

MORE ABOUT HANDLING

Sir:

In your July issue (pp. 95-118) the article "How to Get More for Your Handling Dollar" had a chart showing the number of persons involved in materials handling vs. total employment for the selected industries. Would it be possible to furnish me a breakdown of the classification of the persons reported involved in handling materials? It is not clear whether these employees load and unload, work with stores in getting materials to machines, or handle goods in process.

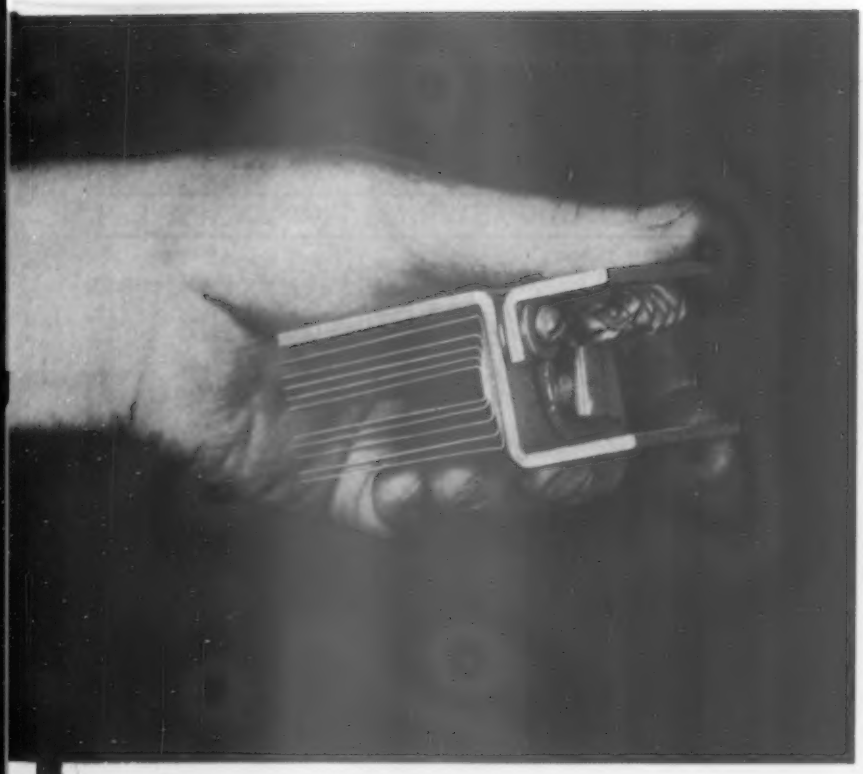
Charles M. Crenchaw
Industrial Engineer
General Cable Corp., Bayonne, N. J.

► We assume Reader Crenchaw is referring to the chart on p. 97. The left-hand bar chart shows number of people whose job consists entirely of handling. These people are indirect labor. Typical jobs: fork truck operator, crane operator, truck dispatcher, warehousemen, materials-handling expediter, etc. Excluded from the chart is the handling done by direct labor people in the course of their jobs—machine operators, assemblers, and the like. The right-hand chart is different. It includes 100% of the labor hours of indirect workers mentioned above, plus our respondents' guesses as to percentage of time their direct labor people spend in handling—loading and unloading machines and the like.—ED.

PACKAGED TRAINING

Sir:

The distinguished experts C. R. Dooley and E. C. Peckham appear to cross swords not on the pro's and con's of packaged training programs but on the meaning of the label to them as individuals (FACTORY,



GERMANIUM RECTIFIERS PERFORM WITH TOP EFFICIENCY

Udylite Tests Reveal Amazing Current Conversion Efficiency

This air cooled germanium cell with a rectifying surface the size of a dime will handle a 250 ampere load in a three phase circuit continuously and three years of tests show no detectable power losses. Including heat-radiating fins, it takes up just 8 cubic inches of space and weighs only 12 ounces.

Udylite in cooperation with the General Electric Company, now proudly introduces its new group of germanium rectifiers. Years of research and testing have proven that no other metal known offers the high efficiency of germanium as a rectifier material.

In operations calling for medium to high voltages, such as barrel plating, anodizing or chrome plating the efficiency of germanium soon pays the cost since the efficiency of a 3-phase germanium cell is *98* to *99 percent.*

Even at high loading germanium has less than one-volt drop in the forward direction. As for reverse current, germanium is again particularly good, having a reverse-to-forward resistance ratio of 400,000 to 1. Furthermore, Udylite germanium rectifiers require little maintenance and can be located in areas of minimum ventilation.

For further information regarding germanium rectifiers—prices, deliveries and specifications—consult your Udylite representative or write today direct to:

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Mighty handy piece of materials handling equipment is this Towmotor Fork Lift Truck which high-stacks 3300-pound loads of sheet metal for a prominent steel fabricator—increasing storage capacity 70%.

the HIGH and the MIGHTY...

There are many steps required to turn raw materials into finished products and Towmotor Fork Lift Trucks are at home in receiving, processing, assembly, storage, or shipping jobs. By *Mass Handling* materials, Towmotor speeds production and distribution, cuts storage costs, strengthens *every link* in your chain of operations. For Certified Job Studies covering savings in your particular industry, write TOWMOTOR CORPORATION, Div. 511, 1226 E. 152nd St., Cleveland 10, Ohio.

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Part of Janitrol's superior performance is easily understood by this record: less than ¼ of 1% of over a million Janitrol heat exchangers installed since 1940, have failed from any cause.

If quiet operation, coupled with fast heating response and built-in safety controls are features you want . . . then, Janitrol should be your selection for your best heating buy. Call a local Janitrol factory authorized dealer, he is listed under "Unit Heaters", yellow pages, your phone book.

Write today . . .
Get your copy of the "Businessmen's Blue Book of Better Heating", it's full of useful information on the proper installation of unit heaters.

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GAS-FIRED UNIT HEATERS

Janitrol Heating
& Air Conditioning Division
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Toronto 13

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES AND *Kathabar* HUMIDITY CONDITIONING

August 1955, p. 106). Their controversy appears one of emphasis and degree rather than definite yes or no.

May another be permitted to mix his point of view with that of the experts?

1. Canned [training] courses apparently have advantages. What's in the can is good. Why do they not do a complete training job? Because the trainer does not take the material out of the can and adapt it to meet the specific needs of the trainees. This does not make the material in the can bad.

2. In addition to the values of packaged programs, Mr. Peckham points out several weaknesses. He would lead us to believe that these programs are a complete failure, and void of worth. Such criticism should better be leveled at the uses to which the program is put, rather than the program itself. A program, packaged or not, has nothing of value until put to use. The skill of the trainer can highlight the values or expose the elements to criticism. This is not the fault of the program. Packaged programs are only as effective as the trainer who puts them to use and adapts their content to fit—and fulfill—needs of trainees.

Stanley C. Stromberg
Management Training Group
North American Aviation, Inc.
Los Angeles

WOOD SASH, TOO

Sir:

We have just read with considerable interest . . . "Why Steel Sash Goes Wrong" (FACTORY, May 1955, p. 110).

In the latter portion . . . there is a section headed "What About Other Sash?" Here we find a paragraph devoted to wood. About all that is said about wood is that it rots easily and . . . that copper or zinc naphthenate wood preservatives are good for severe conditions.

For the past 15 years or so this association has worked diligently on a program of wood preservation with respect to the millwork industry, which of course includes windows as well as door frames. So far

NEW ATOMIC CANNON

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

This mobile 280 mm. atomic cannon has *two* recoil motions. The primary recoil absorbs the cannon's "kick". The secondary recoil (something new in artillery) absorbs the forces created by the primary recoil. And each recoil motion is recorded by this special Veeder-Root Counter designed with a plunger-action shaft . . . which keeps the score on the cannon's use and indicates approaching need for maintenance.

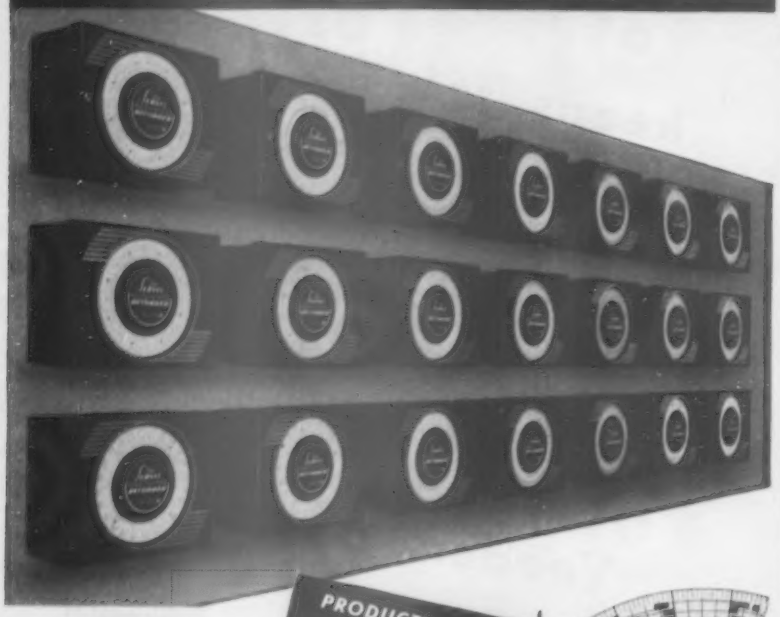
This again points up the fact that "Anything Worth Making — or Worth Doing — *Is Worth Counting.*" And Veeder-Root has the experience and resources *you* can count on, to give you any counter you need . . . for any mechanical or electrical application . . . in any field from Atomics to Automation. Write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT

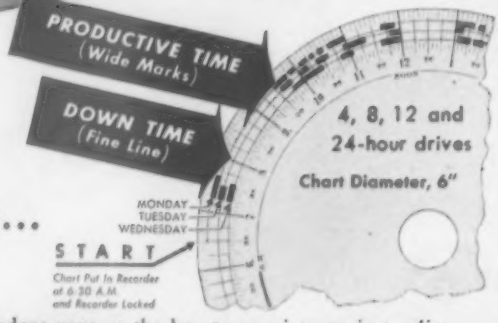
Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"The Name that Counts"

How SERVIS RECORDERS cut rejects



Key To Unlock New Store of Productive Time. Mount in Your Office... on the Machine...



"Model M Servis Recorders gave us the key to consistency in quality, cut rejects and naturally improved profits." A rubber molding plant installed this panel of Servis Recorders in the foreman's office to check the baking cycle of its products, and found that at certain times of the day this cycle was incomplete. Result—rejects . . . high costs . . . idle men and machines.

Permanent, easily read Servis Recorder charts were the key to solving this quality control problem. If you need help measuring busy and down time of machines, mixers, ovens, or if controlling quality, studying rates and schedules are a problem, send in the coupon below.

Either electrical or compact mechanical models of Servis Recorders pay for themselves in no time. Mechanical models actuated by motion of machine or industrial truck also are quickly installed and give permanent, unquestioned records.

For the complete story send for this booklet today

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

THE SERVICE RECORDER CO.

1375C Euclid Ave., Cleveland 15, Ohio

Begins on page 3

as our member factories are concerned, we feel we have practically solved the decay problem. A large majority of the stock woodwork items produced today are treated with a solution that has been tested and approved by this association. . . . We honestly do not know of a single authenticated case of failure of such windows due to decay.

While it is true that copper and zinc naphthenate preservatives are a big help in preventing decay, it is also true that a major portion of the windows and sash and doors treated by members of this association use the chlorinated phenols, which also should be prominently mentioned in any wood preservation program.

O. C. Lance

Secretary-Manager
National Woodwork Mfrs. Assn.
Chicago

MAINTENANCE COSTS

Sir:

Your articles on maintenance costs have created a great deal of interest among members of our plant. We are now developing a system of maintenance cost control. Do you have, or can you suggest, sources of additional literature?

Carl H. Wurtz

Plant Controller
Automatic Transmission Dept.
Ford Motor Co., Cincinnati

► **FACTORY indexes will be helpful. But a study of the whole cross-section of maintenance paperwork is needed to do a good job. Companies selling proprietary systems will be glad to show their wares. We recommend seeing some of these systems in action. There's a brief discourse in "Plant Engineering Handbook" (McGraw-Hill Book Co.), pp. 291-96, that may help. Cost consultants will be glad to talk over problems. And there's the seminar on maintenance costs at the Annual Plant Maintenance and Engineering Conference next January.—ED.**

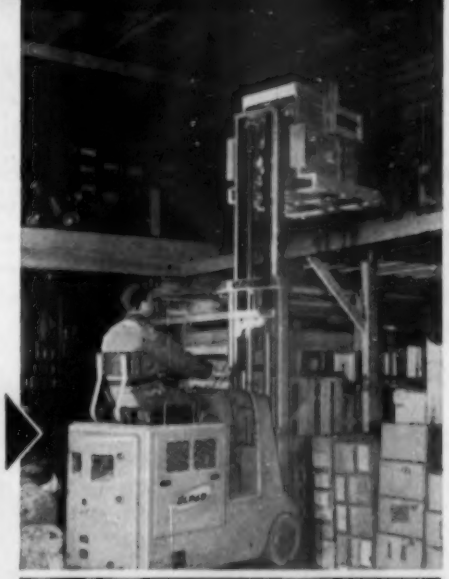
Sir:

Does there exist an official definition of the word "maintenance"

4-way savings with ELPAR trucks

SAVES TIME

Grocery chain uses ELPAR fork truck to move 2,000 cases of food from boxcar to their warehouse. Job formerly took 20 man-hours. Truck now does it in 12—*60% Faster!*

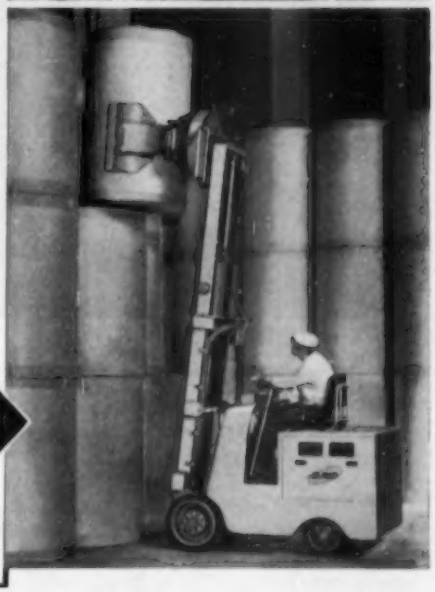


SAVES SPACE

Wholesaler *increased by 50%* the effective capacity of his one-story warehouse with this ELPAR fork truck. Truck acts as "mobile elevator" to utilize space on balcony.

SAVES LABOR

In cold storage plant, four ELPAR trucks *released 16 men for other duties!* Also permitted roof-high storage, and safeguarded perishable foods by faster handling.



SAVES MONEY

Newspaper high-stacks its roll paper with ELPAR Clamp Truck, thus avoiding *$10,000 more storage costs!* Truck repaid its cost in a few months.

FREE TO YOU...

48 YEARS' EXPERIENCE IN MATERIALS HANDLING

Besides data on above installations, here are folders offering you *specific* truck information based on Elwell-Parker's "know-how" gained since 1906. Check those of interest to you.

- ☐ General Catalog
- ☐ Specially-Engineered Trucks
- ☐ Preventive Truck Maintenance
- ☐ Case Histories on above jobs

THE ELWELL-PARKER ELECTRIC CO.
4030 St. Clair Ave., Cleveland 3, Ohio

Please send literature checked.

Name_____

Title_____

Company_____

Street_____

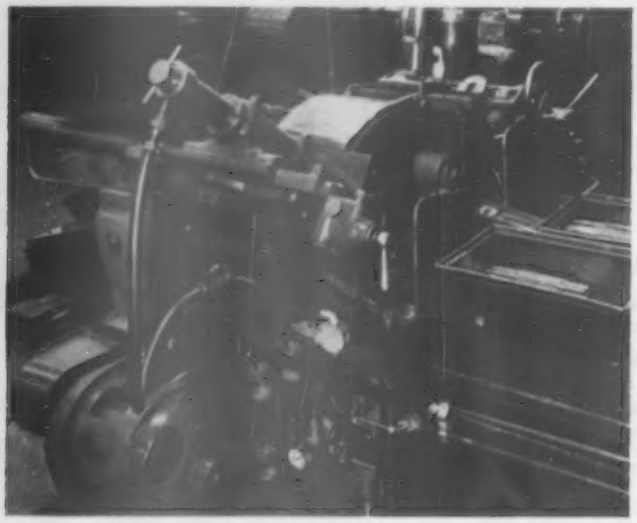
City_____ State_____

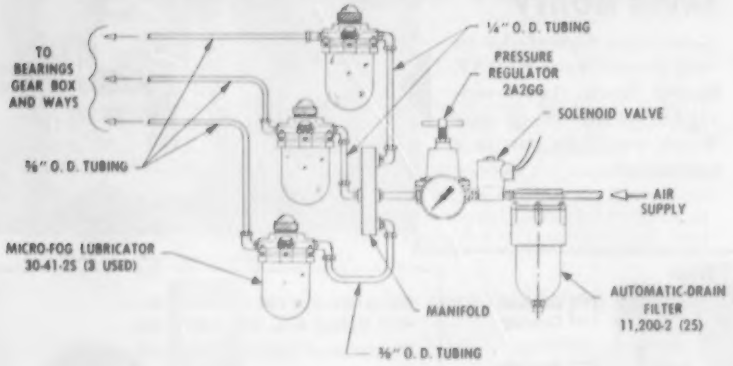
Leads The Field The First Year!

Norgren MICRO-FOG

completely lubricates centerless grinder with only 12 drops of oil per minute

Here's another typical example of how Norgren Micro-Fog provides more efficient, automatic lubrication with minimum costs. Micro-Fog, replacing a pump recirculating system on the centerless grinder, uses only 12 drops of oil per minute to lubricate the drive bearings, thrust bearings on wheel spindle, journal bearings, gear change box, journal and thrust bearings on back up wheel, and two sets of ways. A unique system of chevron grooving in drive shaft bearing aids in Micro-Fog distribution.





THE NORGREN MICRO-FOG LUBRICATION EQUIPMENT

For complete details on this Micro-Fog application write for Blueprint MF 15 or phone the Norgren representative listed in your telephone directory classified section under Norgren Pneumatic Products.

C. A. Norgren CO.
3421 So. Elati, Englewood, Colo.

Begins on page 3

or any list of items that are to be considered maintenance instead of operating? For instance, take maintenance of gasoline lift trucks. Does consumption of gasoline, lubricating oil, tires belong in the maintenance budget? If so, does the fuel oil for boilers belong, too?

Another question: Is it generally understood that the word "maintenance" includes repairs?

B. A. Margo
Consulting Management Engineer
St. Laurent, P. Q., Canada

► **There's no standard dividing line. Important thing is to be consistent in accounting. We'd be inclined to charge fuel, oil, tires to operating. Generally speaking, "maintenance" includes upkeep and repairs. Upkeep can include cleaning, adjustments, lubrication, and so on. Perhaps there should be three main cost divisions: production, operating, and maintenance. Production would be direct labor and materials. Operating would be all indirect labor, including area set-up men, adjustments, lubrication, etc. Maintenance would be strictly limited to repairs.—ED.**

Sir:

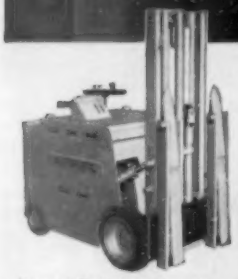
I am interested in any maintenance cost indexes you might have compiled for industries such as ours —per dollar investment in equipment or plant. . . We have accurate labor and material costs, plus detailed cost records of machines, but can strike no comparison to verify whether costs are in line with existing practices in like industries.

Richard K. Fritsche
Plant Engineer
Miami Margarine Co., Cincinnati

► **We take it Reader Fritsche wants to find out how well he's doing. Suggestions: "What Should Maintenance Cost?" (FACTORY, Jan. 1953); "Cost of Maintenance in 75 Industries" (FACTORY, Oct. 1945). Also a paper by J. E. Sutherland, "What Does Maintenance Cost?," read at the First Annual Maintenance Conference, Cleveland, 1950. But let Reader Fritsche beware—comparing maintenance cost figures is full of pitfalls.—ED.**

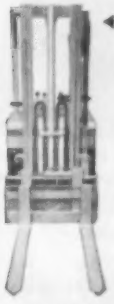
Leads The Field The First Year!

Automatic® "DOCKER"



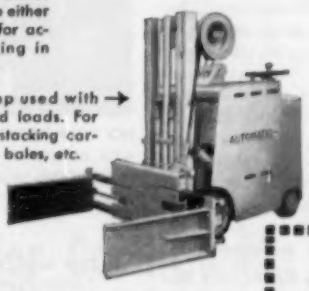
Hinged forks for convenience in adding attachments. Reduces overall length for transportation in elevators.

Paper roll clamp handles wide range of roll sizes. With rotating carriage up to 360°.



← Hydraulic side-shifter moves loads to either side of truck for accurate stacking in box cars, etc.

Carton clamp used with nonpalletized loads. For moving and stacking cartons, crates, bales, etc. →



From the first—only a year ago—the DOCKER'S outstanding superiority assured it universal acceptance in industry. It was and is unrivalled in compactness, maneuverability and in such details as shortest overall length—lowest step height—fastest lift—highest grade clearance—shortest turning radius. Shown on the left are four of the special attachments which make the DOCKER the most versatile of lift trucks. There are many more. Why not find out what the DOCKER can do for you.

Available in Mono-lift or Duo-lift
1,000 to 3,000-lbs. capacities

MAIL COUPON TODAY FOR FULL DETAILS

Automatic 39 West 87th St., Dept. W-5
Chicago 20, Illinois

Without obligation, please send me full information on the versatile Automatic Docker.

Company Name_____

By_____ Title_____

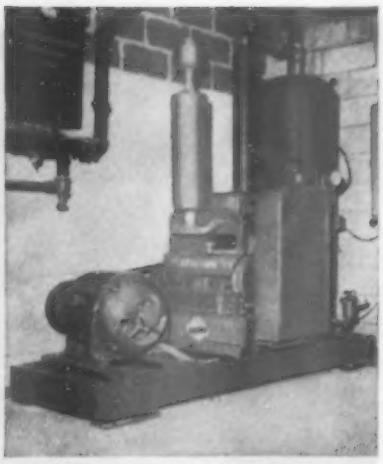
Address_____

City_____ Zone_____ State_____

Automatic®

WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC-DRIVEN INDUSTRIAL TRUCKS

Schramm Model 50 Air Compressor and 15 HP motor are mounted on a 24″ x 72″ receiver and the complete unit installed on a light frame above a welding unit by this Holland, Michigan boat builder. Unit provides 50 c.f.m. of free air for operating hand grinders and chipping hammers.



ADEQUATE POWER WITH PROPER CONTROL. Schramm compressors may be driven by any source of rotative power. Motors can be supplied as original equipment. Illustrated is V-belt drive.

JACKETED LIQUID COOLING SYSTEM. Units delivering 85 c.f.m. and over are jacketed for liquid cooling. Furnished with inlet and outlet flanges or Schramm cooling unit.

NO FOUNDATIONS. Schramm balanced design permits installation without expensive foundations. Units can be set up in almost any out-of-the-way location.

MICHIGAN MANUFACTURER PROVES:

Air compressors need not take up valuable floor space

Floor space, in modern industry, is a major *production* factor. With Schramm, Inc., space has always been an important *design* factor. Schramm units of all sizes are designed to produce a maximum amount of free air—take up a minimum amount of factory space. *There is no more compact air compressor made.*

Schramm Industrial Compressors offer many design features found in no other machine. Balanced reciprocating parts give vibrationless operation, permitting out-of-the-way installation without special foundations. Schramm engineered cooling systems—air blast for units delivering 50 c.f.m. of free air, or less; liquid cooling for larger sizes—provide adequate cooling for full load, permitting continuous operation. All Schramm units have mechanical intake valves, long-life discharge valves, gear type pump lubrication and multi-cylinder construction with 90% interchangeable parts between sizes.

The economic advantages of buying Schramm Industrial Compressors are outstanding. Initial cost, compared with other compressors delivering the same amount of free air, is low. Maintenance of Schramm compressors is no problem—any mechanic who understands gasoline engines understands Schramm compressors. And Schramm forced lubrication reduces wear on all moving parts. A Schramm Model 315 Unistage Compressor, after operating 5,500 hours, showed only .0005″ wear on the main bearings.

Schramm manufactures a complete line of Air Compressors and accessories for all industrial uses. Write today for free literature. Catalog GC-55 describes our Small Industrial Air Compressors, Catalog 5510, Industrial Air Compressors. You will also want a copy of our informative booklet, "Piston vs Rotary Air Compressors." There are no obligations.

Your local Schramm Dealer is listed in the Yellow Pages of your telephone directory.

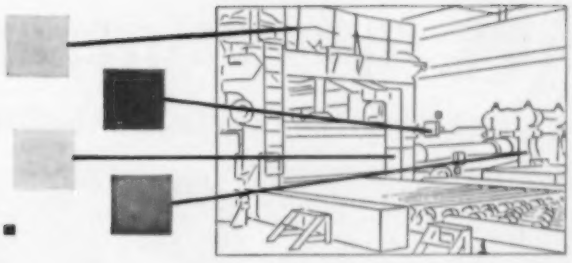
Schramm, Inc.

MANUFACTURERS OF AIR COMPRESSORS

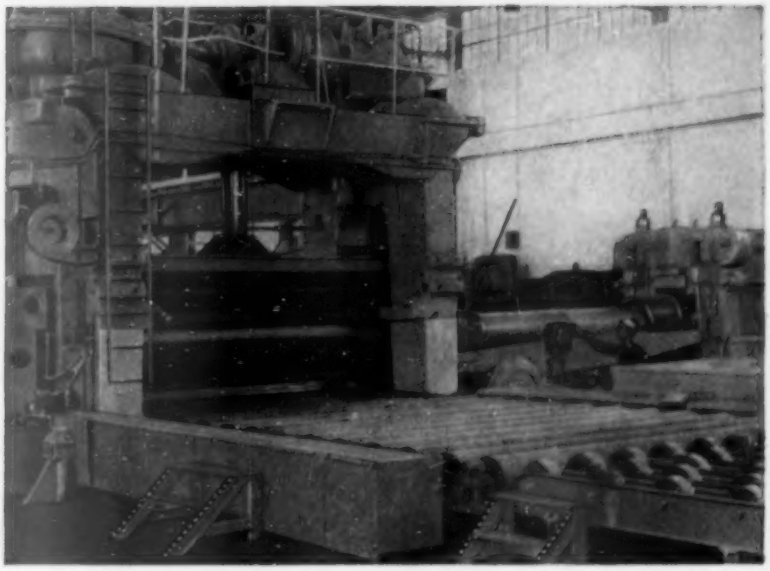
690 North Garfield Avenue

West Chester, Pa.

By using
the right colors
in the right places...



DU PONT COLOR CONDITIONING



increases production, boosts morale, promotes safety!

EVERY DAY, the value of Du Pont Color Conditioning is being proved over and over again in hundreds of industrial plants, office buildings, hospitals, apartment buildings, schools, restaurants and stores.

In work areas and offices, Du Pont Color Conditioning increases the rate and quality of production . . . reduces accident rates by improving visibility and pointing up danger zones. In cafeterias, wash rooms and recreation areas, Color Conditioning creates a cheerful, inviting atmosphere . . . makes for better employee relationships. And in schools and hospitals, restaurants, and stores, Color Conditioning puts color to work to make people see better, feel better and work better.

Du Pont Color Conditioning costs no more than ordinary maintenance painting; it actually costs less in the long run. And new paint formulas make Color Conditioning Paints *odorless* during application! Now you can put this scientific painting plan to work for you without the annoyance so often caused by paint odors. Discover the many ways Du Pont Color Conditioning can pay off for you. Mail the coupon today!

FREE 32-PAGE BOOK! *Find out how Color Conditioning can meet the specific needs of your building interiors. Get this book, illustrated in full color. Mail the coupon today!*

Du Pont Color Conditioning Paints Are Now Odorless

Now you can paint busy areas without interrupting normal routine

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

E. I. du Pont de Nemours & Co. (Inc.)
Finishes Division, Dept. P-511
Wilmington 98, Delaware

Gentlemen:

Please send me, at no extra cost, your 32-page book, "Du Pont Color Conditioning."

Name_____

Title_____

Address_____

City and State_____

New, radio-active, automatic fire guard!

C-O-TWO PRE-DETECTOR SYSTEM

Each pre-detector head protects up to 3,600 square feet of area . . . harmless radio-active element utilizing ionization chamber principle quickly detects all forms of fire . . . requires only simple two-wire circuit and insignificant wall space for controls.

This completely new and positive means of spotting fire is just what you've always needed and wanted . . . detects in the earliest stage, invisible combustion gases, visible smoke, slow smoldering, as well as open flame. The C-O-TWO Pre-Detector System is simple to install, extremely economical to maintain and doesn't depend on thick smoke or heat for actuation.

As many pre-detector heads as necessary can be connected together in a single circuit and up to 16 separate circuits or spaces handled by one system. With a single circuit the pre-detector heads are connected directly to the fire indicating cabinet, while with multiple circuits the pre-detector heads are first connected to one or more space indicating cabinets capable of visually showing by number the exact location of the fire. Relays perform such functions as sounding alarms, closing fire doors, shutting down ventilation and releasing fire extinguishing systems.

The C-O-TWO Pre-Detector System has been subjected to extensive testing and carries Underwriters' Laboratories, Inc. listing, as well as Factory Mutual Laboratories approval. Proven pilot installations have been made in such diversified properties as a television station, an electric power company network analyzer room, a railroad signal tower, an airline flight training equipment room and the offices of an insurance company.

Don't take unnecessary chances any longer . . . the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts about this new C-O-TWO Pre-Detector System today!

Pyrene

PYRENE — C-O-TWO

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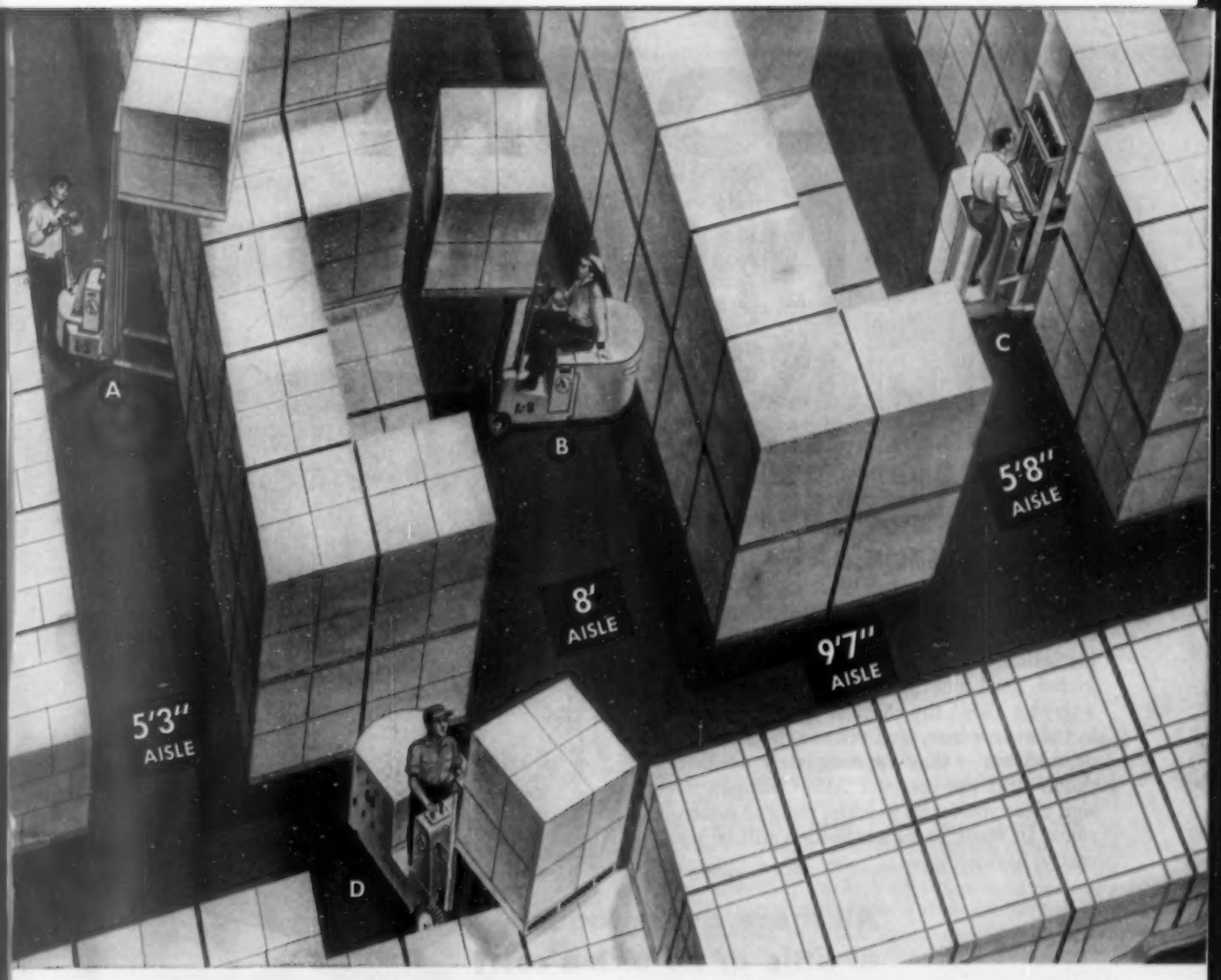
Sales and Service in the Principal Cities of United States and Canada

C-O-TWO

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM



"Aisle-matched" to reduce idle space

THE ARTIST'S DRAWING above shows that *whatever the width of your warehouse aisles there's a Lewis-Shepard Master Truck to match.* Shown are four L-S Master Trucks right-angle stacking the same 2000 lb., 40" long load in various size aisles. *You* decide the most practical aisle width . . . then select the Master Truck that matches *your* requirements.

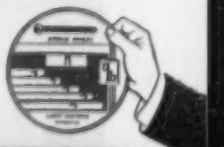
Remember, Lewis-Shepard offers you *every type of truck made* — from lightweight two-wheelers to huge fork lifts . . . the *only* complete line of materials handling trucks on the market. And, because your local L-S Representative has this *complete* line, he's in a better position to advise you . . . he's not biased in favor of one type truck or design.

Dependable L-S Master Trucks are ordered and reordered by "blue-chip" companies. Recent reorders include:

Electrical Goods Mfr.	105 L-S in use — reordered 7
Rubber Mfr.	13 L-S in use — reordered 2
Spark Plug Mfr.	20 L-S in use — reordered 1
Aluminum Mfr.	14 L-S in use — reordered 4

Illustrated are: (A) JackStacker, 4000 lb. cap. electric "walkie"; (B) Model "J", 2000 lb. cap. riding type at ½ the usual cost; (C) Model "M", 3000 lb. cap., most compact of all riding types; (D) Model "E", 2000 lb. cap., fastest of all electrics.

Write for an L-S "Space Wheel" . . .
tells you aisles required for L-S Trucks and probable savings. Use the coupon.



MULTIPLY MATERIALS HANDLING

"The Master Line"

LEWIS-SHEPARD

1511 Walnut St., Watertown 72, Mass.

Please send

- ☐ L-S Space Wheel
- ☐ (A) L-S Master JackStacker Catalog #34
- ☐ (B) L-S SpaceMaster Model "J" Catalog #33
- ☐ (C) L-S SpaceMaster Model "M" Catalog #35
- ☐ (D) L-S SpaceMaster Model "E" Catalog #32

Name _____

Company _____

Address _____

LOOK!

A Dry-Type Transformer with Class H Insulation

(150 C Rise)

Here's a completely new line of totally enclosed dry-type transformers with Class H insulation. Maintenance is completely eliminated. Dust and dirt are kept out. No more worrying about the effect of lint or moisture in the atmosphere. You can use them indoors or outdoors — they are completely weatherproof. And the compact Allis-Chalmers design gives you lower weights, reduced dimensions. In many cases installation will be less costly, easier.

All these advantages at little or no extra cost!

Best of all, there is no increase in cost in ratings 10 kva and below, single phase, and 30 kva and below, three phase. A slight increase in cost of higher ratings is more than offset by the many new advantages.

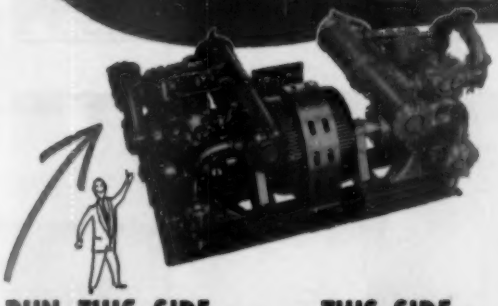
The tank is simple and sturdy — it has four formed corners and only one welded seam. The bottom plate is recessed and held to the case by bolts for quick removal. The coil is given maximum protection with expensive Class H insulating materials. The unit is designed for 150 C rise. The result is a convenient, compact transformer that will give years of satisfactory operating life.

For more information call your nearby Allis-Chalmers distributor or district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

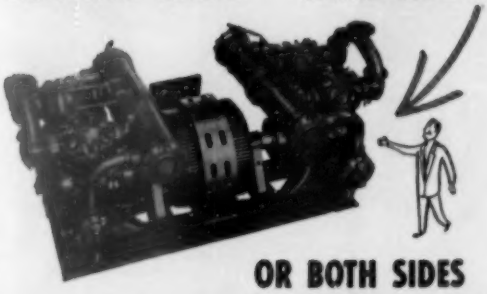
A-4529

ALLIS-CHALMERS

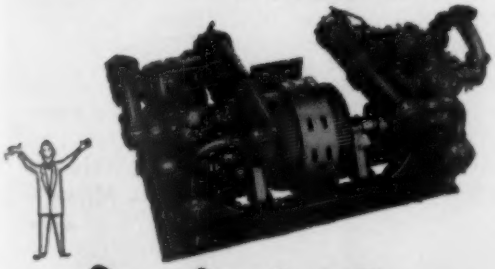
The JOY WN-114 TWIN is a 2-in-1 COMPRESSOR



RUN THIS SIDE... ...THIS SIDE



OR BOTH SIDES



SAVES FLOOR SPACE The Joy WN-114 Twin is actually two heavy duty, semi-radial compressors operating from a single motor. Because of the compact design and one power source, they make the most of limited floor space. The package-type units are delivered ready for mounting on a simple rectangular foundation.

USE ONLY WHAT YOU NEED Either compressor may be run alone by simply disconnecting its twin at the flexible coupling. As demand rises, the twin can be reconnected quickly, easily. This exceptional flexibility is ideal for plants where airpower demands vary greatly.

STANDBY INSURANCE The twin arrangement guarantees an "ace in the hole." When a conventional single compressor breaks down, its production stops completely. Under like circumstances, the Joy Twin continues at 50% capacity.

SAVES MAINTENANCE, OPERATING COSTS The WN-114 Twin is equipped with field-replaceable crosshead and cylinder liners and one-piece, box-type, tinned crossheads that require no adjustment. Patented "Dual Cushion" valves feature large area and low lift to give long, efficient, quiet operation. Displacement range is from 2372 to 3896.

For complete details on Joy WN-114 Twin Compressors, see your Joy representative, or write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

for VANEAXIAL FANS • COMPRESSORS
VACUUM PUMPS AND BOOSTERS
OXYGEN GENERATORS

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

W6D1-8498

MOTOR CONTROL FACTS
ON INDUSTRY'S
MOST COMPLETE LINE

FACT: Here is industry's newest and most advanced high-voltage starter!

This new line of Westinghouse high-voltage fused starters offers industry more protection—more operating simplicity than any other. Here are a few reasons why:

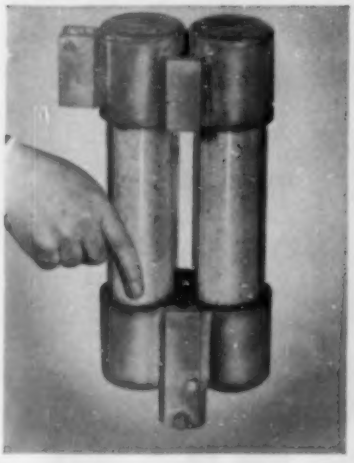
Extension of the BAL fuse line up to 400 amperes with the first and only 400-ampere, double-barreled, single-unit fuse; a new 50,000-kva air break contactor featuring the most advanced arc interrupting action yet developed; and new enclosures providing new levels of convenience and safety.

Booklet B-6535 has more facts on this outstanding new starter. Get it from your Westinghouse engineer—or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

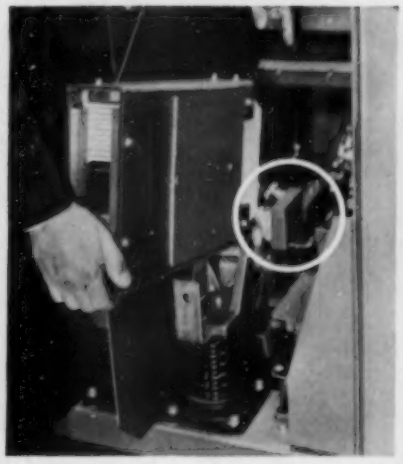
J-21898

YOU CAN BE SURE... IF IT'S

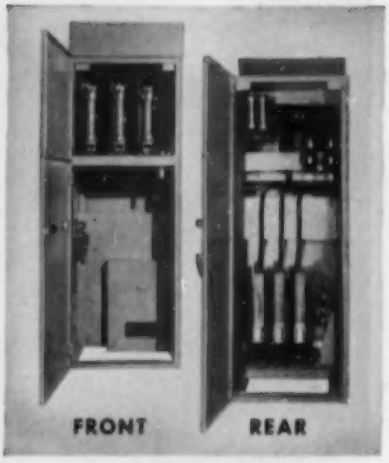
Westinghouse



New 400-ampere, double-barreled, type BAL fuse features "no-bolt" brazed connections which insure equal division of current. Complete coordination of fuses is assured. Exclusive BAL single-barreled design for fuses up to 200 amperes is retained.



New air break contactor (200 and 400-ampere sizes) features a unique arc chute design which greatly simplifies inspection and maintenance of the contacts. Simply pull the arc chute down—contacts are immediately and conveniently accessible.



New enclosure design provides both mechanical and electrical interlocks; front and rear access DOORS; top-mounted bus arrangements; separate compartmentation of high and low-voltage components—all designed for maximum safety of personnel.

FROM INDUSTRY'S MOST COMPLETE LINE OF INDUSTRIAL CONTROL

CONTROL COMPONENTS • MOTOR CONTROL • ELECTRONIC CONTROL • CONTROL SYSTEMS • NATIONAL SERVICES

AIRTEMP GOES "OUT-OF-THE-WAY"

. . . new suspended air conditioner saves valuable office floor space

Only Airtemp offers you this choice in Air Conditioning

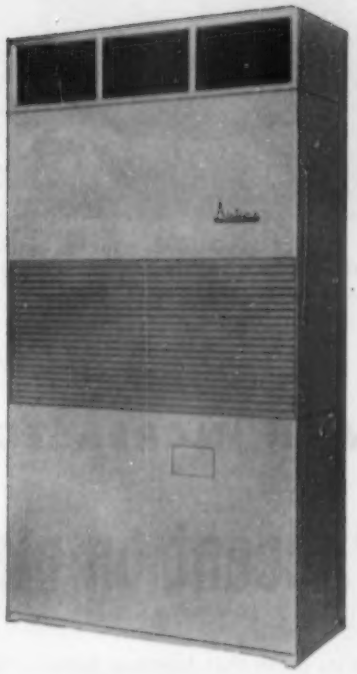
NEW "OUT-OF-THE-WAY" suspended model is the latest Airtemp advancement . . . plus a choice of 13 sizes in WATERLESS or WATER-COOLED packages

The Biggest Value in Air Conditioning for Business

COSTS LESS TO OPERATE AND OWN—longer life and economy is built into every Chrysler compressor—costs less to operate, does more work—*without* vibration! Compressor is completely sealed in oil so that dirt and moisture can't get in.

MORE DEPENDABLE—5-year warranty guarantees the entire refrigeration circuit of every Airtemp "Packaged" air conditioner. You'll find Chrysler-Quality and engineering built in . . . not just assembled, but *manufactured* by Airtemp.

EXPERT INSTALLATION AND SERVICE—your nearby Airtemp Dealer is factory-trained . . . an air conditioning *specialist* who will install your new Airtemp "Packaged" unit properly. We're proud of his prompt, efficient service.



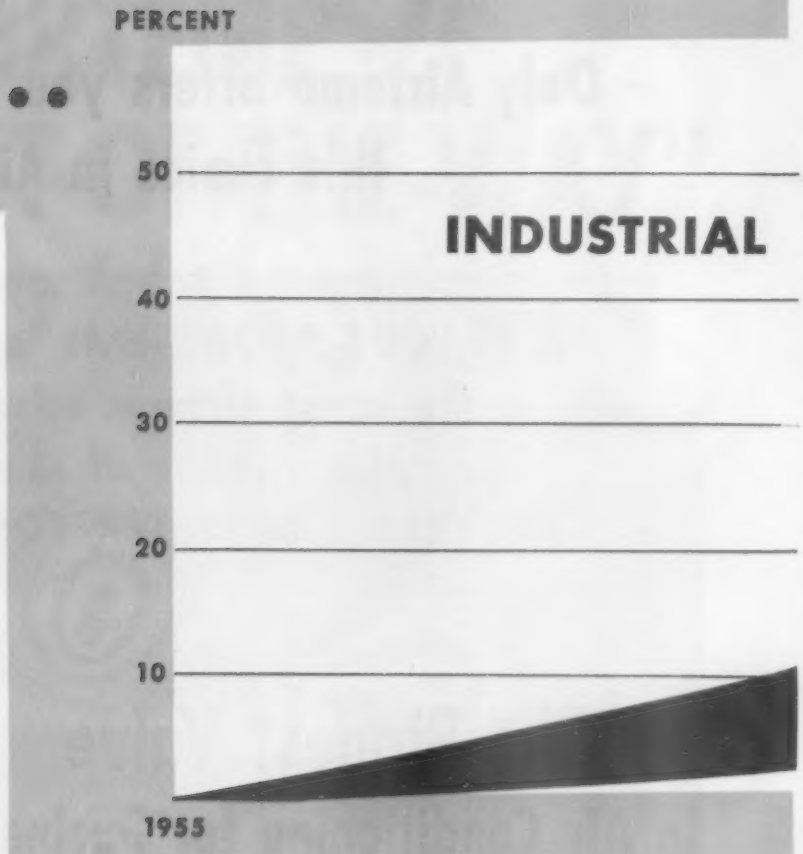
NEW ADVANCED Styling! **IN 13 SIZES—WATERLESS OR WATER-COOLED PACKAGES FROM 2 TO 30 H.P.**

Call your Airtemp Dealer now (he's listed in the Yellow Pages). Or write Airtemp Division, Chrysler Corporation, Dayton 1, Ohio, for the name of the dealer nearest you.

Airtemp DIVISION CHRYSLER CORP

AIR CONDITIONING • HEATING FOR HOMES, BUSINESS, INDUSTRY

By 1965...



H. F. McCULLOUGH, general manager, Service Shops Department, General Electric Co. explains below why . . .

WITH INCREASED EMPHASIS ON AUTOMATION . . .

"Accent on maintenance" becomes industry's

It's no secret that American industry today is making giant strides into a new era—marked by the increased use of automatic machines, more continuous process methods, and a greater application of electric power per manhour. This era of automation is a result of the sharpening of competition, requiring more production from existing equipment, better methods for making better products, and better machines to do more work at less cost.

• **Taken for granted**—But all this is focussing new attention on a production factor hitherto taken for granted—maintenance. For as more automatic machines are introduced to quicken the production tempo, and to make up for limited available manpower and to reduce product cost, the maintenance function assumes a far greater importance. As one indication of this, the cost of all industrial maintenance in 1952 was over $11 billion, while by 1965 it is estimated to reach $22 billion annually.

• **Production demands**—Present and future production demands require the training of highly skilled and well planned maintenance to prevent idle machinery and profit-eating downtime costs. The ultimate aim of any maintenance program is to reduce unit cost of goods sold; therefore, planned maintenance helps the manufacturer do this by getting the maximum use from his equipment and reminding him to make modifications or renewals on a planned rather than a hit-or-miss basis. With this trend towards automation, today's stepped-up production combined with increased labor, materials and equipment costs dictates a scheduled maintenance program.

• **Maintenance not ready**—On its present scale, maintenance cannot successfully cope with the staggering job ahead. To back up the abilities of maintenance men and their effective use of tools and materials, management too must apply to maintenance the same skill, brains and capital investment that have so strikingly improved production planning and techniques. In fact, with automation, production itself depends largely on the proper planning and execution of equipment maintenance.

• **Involuntary shutdown**—It must be remembered that an emergency downtime during production not only results in

key to all future production planning

lost production and profits, but also forces upon labor an involuntary layoff; therefore, machinery equipment failure is as disastrous for all when it occurs on a production line geared for high production with a large degree of automation. Again it comes down to the question of maintenance. Does management wait for a failure then apply maintenance on a put-out-the-fire basis or does management put into effect good maintenance practices, scheduling maintenance at times most convenient to the production line. Scheduled maintenance minimizes the "dollar" loss. Naturally all emergency shutdowns cannot be eliminated, but Productive Maintenance can and is reducing such situations.

• **Management and maintenance**—One fact that emerges is that management and maintenance must join forces in a carefully thought-out program to meet the challenge of automation. Both are part of the company team, interested in bringing the many benefits of planned equipment maintenance to the over-all job of delivering goods to customers on time, using manpower most efficiently, and keeping product cost low.

FOR AN EFFECTIVE APPROACH TO THIS IMPORTANT PROBLEM

GENERAL ELECTRIC

When management teams up with maintenance, the result is

YOUR G-E MAINTENANCE SPECIALIST will supply complete parts data . . .

. . . guide you in planning routine inspection, routine maintenance and parts inventories . . .

Start now with General Electric's

HERE'S THE 5-STEP PLAN IN BRIEF: (and General Electric can help you with every step)	1 Gather complete equipment data from your machines and motors	2 Evaluate routine maintenance to determine how much care is warranted
3 Establish a routine operating control system	4 Evaluate the critical maintenance that is needed	5 Establish a critical maintenance program

more effective maintenance that actually adds production capacity

. . . help you determine condition of all critical equipment and help schedule planned overhaul . . .

. . . help analyze critical equipment for best protection of each machine.

5-step *Productive Maintenance* plan

It organizes the application of men, tools and materials to help protect capital investment, increase productivity, reduce product cost

A practical, realistic approach to the growing importance of maintenance in the automation era is General Electric's Productive Maintenance plan. In a simple 5-step sequence, it organizes the elements involved in controlling equipment downtime to improve maintenance of electrical systems. Because it is applicable to any type of industrial operation, it is becoming widely accepted throughout industry by management and maintenance men alike. Learn more about how this plan can help you obtain more output from existing facilities. Use the coupon to have a G-E Maintenance Specialist call and supply you with complete information. General Electric Co., Schenectady 5, N. Y.

General Electric Company
Apparatus Sales Division, Section A801-17
Schenectady 5, New York

- ☐ Please send me the detailed manual (GEA-6087) on setting up a Productive Maintenance Program in my plant.
- ☐ Please have a Maintenance Specialist from my nearest G-E Service Shop call on me.
- ☐ I would like to schedule a showing of the film "Productive Maintenance."

NAME.....
POSITION.....
COMPANY.....
CITY..... **STATE**.....

***Productive Maintenance*—as vital as production itself!**

GENERAL ELECTRIC

cut with confidence . . . **HERE'S THE**

New LeBlond Dual Drive Lathe

Reduces Pipe Handling Time by 83%

NEW LeBLOND DUAL DRIVE

best buy for medium duty turning

More than ever before, LeBlond's new 15" Dual Drive lathe gives you efficient capacity at low cost for the great proportion of your lathe work.

With a single lever, the operator commands a smooth and powerful range of 16 spindle speeds from 31 to 2400 rpm. The proven combination gear-belt drive headstock provides twelve gear-driven low and intermediate speeds; 4 high speeds are driven through a positive Gilmer-type belt that requires no adjustment. The 5 hp motor is ample for all work up to that which requires the power of a heavy duty.

The new bed is rigidly ribbed and is fitted with hardened and ground replaceable steel inserts according to LeBlond's compensating veeway principle for better distribution of cutting forces. Chip pan slides in grooves, is easy to clean out. Precision under load is assured by one-piece apron design and long carriage wings with plenty of bearing. Quick-change box is totally enclosed. The tailstock is the same rugged offset-handwheel type used on all LeBlond heavy duties.

All in all, you'll find the new Dual Drive a very fine, yet moderately-priced machine that will take good care of all but the most unusual requirements. See your nearby LeBlond Distributor or write for Bulletin 6A.

. . . cut with confidence

THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 68 YEARS*

Reduces Pipe Handling Time by 83%

Savings Pay for Tramrail System in One Year

▲ The Tramrail transfer crane travels in the middle bay and connects as desired with the spur tracks over the side bays, thus enables the hoist carrier reaching every part of the room. Incoming pipe is lifted from railroad cars with a Cleveland Tramrail hoist carrier operating on a track serving the floor above and lowered through the hatchway at one end of this warehouse.

◀ Outgoing pipe is brought directly from storage to trucks. The hoist and entire system is rated at one ton.

SEVERAL hundred tons of ⅛ to 16 inch diameter pipe are received at the Pipe Warehouse of Palmer Supply Co., Seattle, Washington, per month. To handle this by hand was such a loathsome chore that it was difficult to keep men at this work, and the labor turnover was large.

The installation of a Cleveland Tramrail track and transfer crane system took over the fatiguing job of lifting, as well as hauling, of the pipe into and out of the warehouse. It made possible the handling of large, heavy bundles per trip in less time than required for one or a very few pipes by manual handling. It thereby reduced the man-hours required for pipe handling to approximately one-sixth. Resulting dollar savings paid for the system in one year.

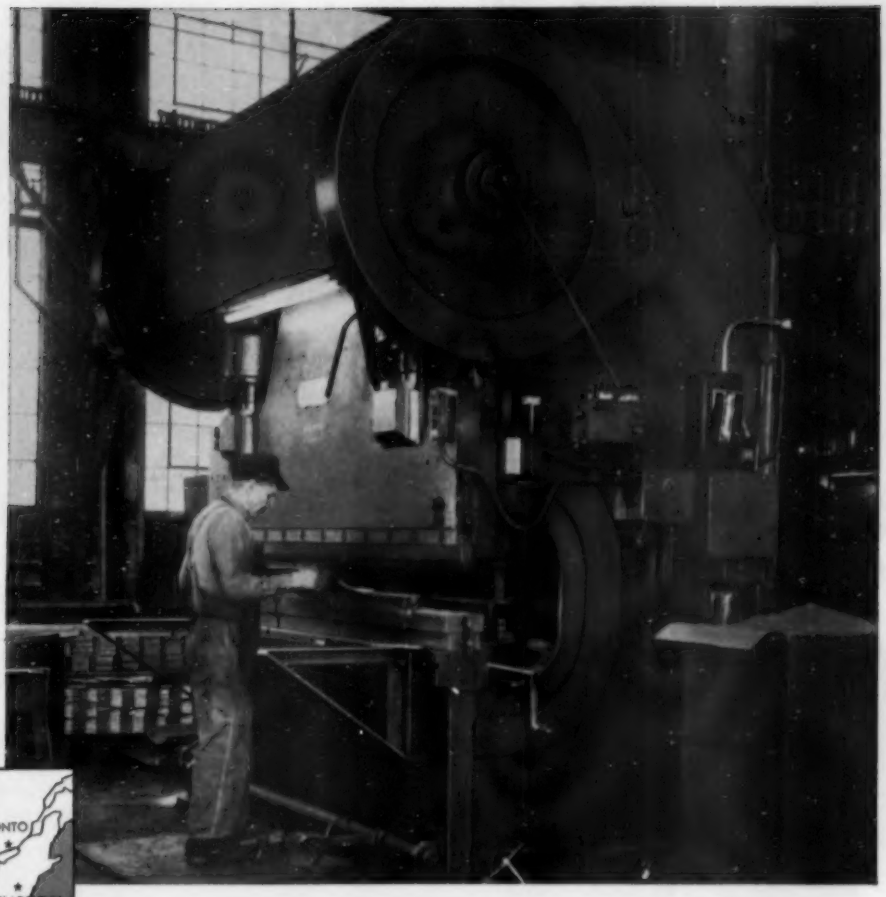
Cleveland Tramrail equipment offers you so much and pays off in so many ways for such a long time that we urge you to study its possibilities in your plant.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3207 EAST 290TH STREET, WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



Installed in the Chicago plant in 1948, this 260 ton capacity machine, Model J4½-6, forms the smaller and lighter gauge conveyor panels. Illustrated is a curved section being formed of ⅜" plate to a radius of 8".

STEELWELDS Serve Link-Belt Plants *From Coast-To-Coast*

NINE LINK-BELT Company plants located from California to Pennsylvania, Texas to Ontario, Canada, and in Transvaal, South Africa, have one to six Steelweld Presses and Shears. Nearly every year since 1944 more Steelwelds have been purchased. Slightly over half of the machines are shears.

As a large manufacturer of a wide variety of conveying and processing equipment such as apron, screw, oscillating and overhead chain trolley conveyors, railroad car dumpers, bucket elevators and other handling equipment, Link-Belt plants must shear and form a great amount of steel plate. From experience, Link-Belt has learned that Steelwelds are outstanding for this work.

There are several reasons for this. For instance, the accessibility of controls and ease of making adjustments. The all-around solid construction that permits continuous operation with hairline accuracy. The heavy, well designed machinery which requires minimum maintenance.

Like Link-Belt, when you really get to know Steelweld Bending Presses, you, too, will be elated with their performance.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

3263 EAST 281ST STREET, WICKLIFFE, OHIO

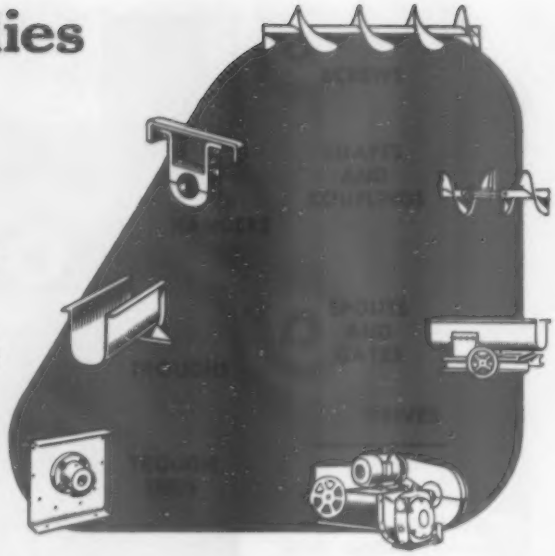
STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

AAF BETTER AIR

How Link-Belt applies STANDARD or SPECIAL screw conveyors to meet your needs



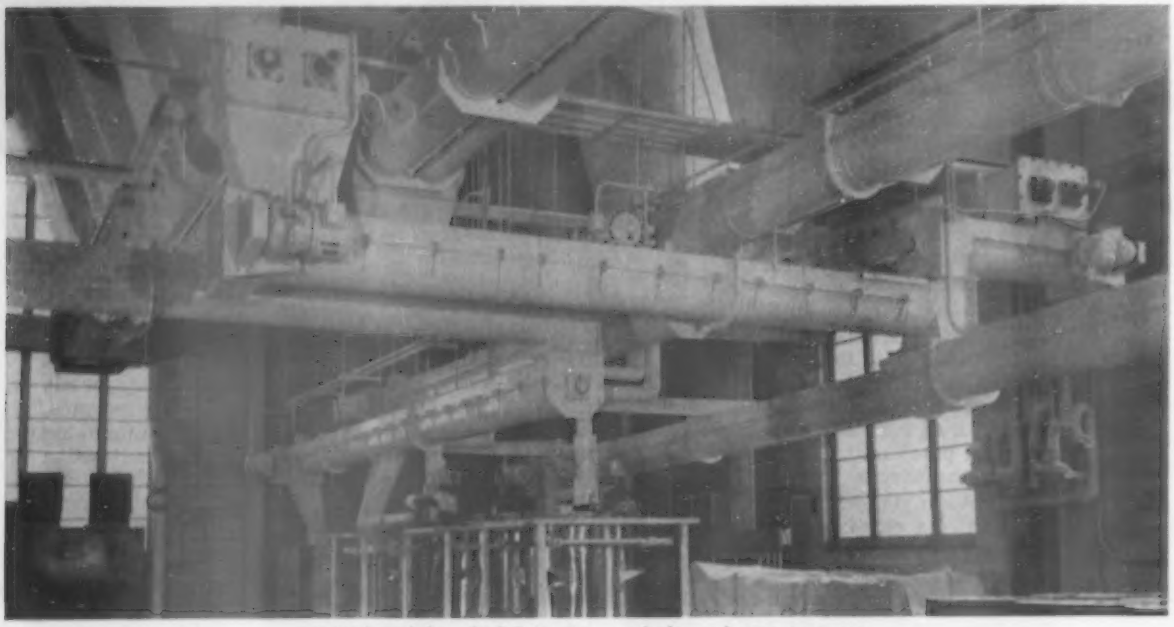
This 4-phase service saves you time . . . spares you details

ANALYSIS AND ENGINEERING service is provided by a district sales office in your area. From long experience, Link-Belt District Engineers can quickly ascertain the best conveying arrangement for you.

COMPLETE LINE OF SCREW CONVEYOR COMPONENTS and related elevating, conveying and power transmission equipment is your assurance that specific needs are fulfilled efficiently and economically.

EASY ERECTION is achieved because of pre-fitting, match marking, close-tolerance manufacturing and Link-Belt drawings. Link-Belt will handle erection if you wish.

SATISFACTORY PERFORMANCE is assured when you rely on Link-Belt as a single contract source for your complete system. We will accept full responsibility for placing it in operating readiness.



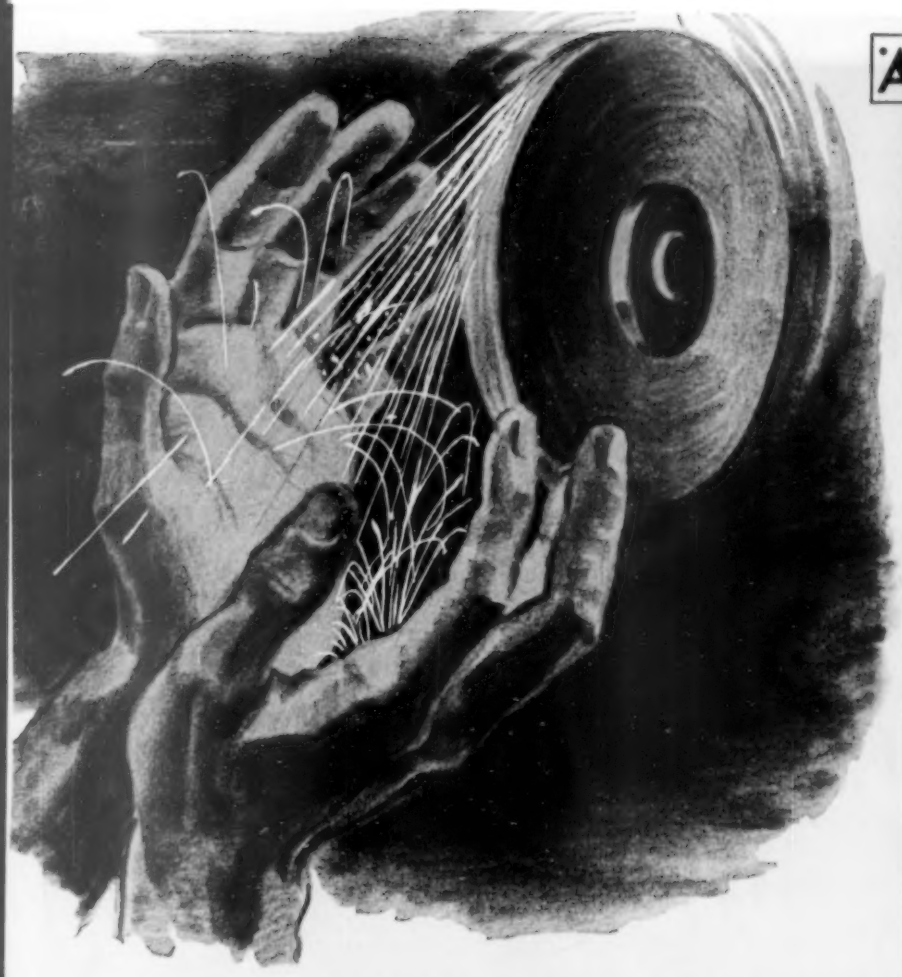
At Midwest bakery, Link-Belt twin screw feeders and screw conveyors provide sanitary handling of sugar and flour to bins and sifters.

Extensive engineering experience has provided Link-Belt with standard solutions to specialized screw conveying requirements. In addition, local availability of Link-Belt engineering service and quality components assures prompt, efficient action. That's why—whether you plan a complete new system or improvement of present arrangements—a call to your nearest Link-Belt office is a sure step to lower handling costs.

LINK-BELT

SCREW CONVEYOR EQUIPMENT

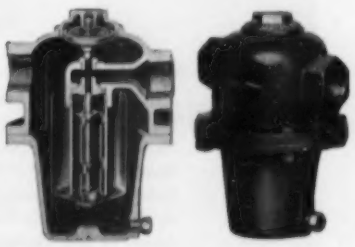
LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 12,012



BETTER AIR IS OUR BUSINESS!

AAF ROLL-O-MATIC—an automatic air filter featuring a renewable media filter curtain of bonded glass fibers in roll form. As clean media is introduced at top of filter, soiled material is re-rolled at bottom.

herman nelson **Unit Blowers**—a new, diversified line of direct and belt driven centrifugal fans available in a wide range of wheel diameters and capacities.



Illinois Float and Thermostatic Traps—made in five series for operating ranges from 50 pounds pressure to 25 inches vacuum.

taking the grime out of grinding

As industry's most universally used piece of equipment, the grinding wheel is also one of its major dust sources. Almost a quarter century ago, AAF singled out this tool as a prime target for dust control.

The goal—effective, low cost dust removal from the work area without restricting efficiency of the grinding operation. Today, thousands of grinders—bench, stand, portable, swing frame and high speed production units—are served by AAF Dust Control Equipment with lower maintenance costs, better employee and community relations as the inevitable results.

Over the years, AAF, through continued research and product development, has extended these benfits to practically every industrial dust producing operation. One of its sales engineers is located in your area—ready to place at your disposal the world's most complete line of dust control equipment backed by a success record unmatched in the industry. Call him today or write direct.

ROTO-CLONE AMERclone AMERjet
Dust Control Equipment

AAF — herman nelson

American Air Filter
COMPANY, INC.
361 Central Avenue, Louisville 8, Kentucky
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I would appreciate receiving catalogs describing the following equipment—

- ☐ *Roll-O-MATIC* Air Filter
- ☐ **ROTO-CLONE** Dust Control Units
- ☐ **Illinois** Traps
- ☐ *herman nelson* Unit Blowers

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City_____ State_____

NEW! "Magnamatic"...

CONTROLLED TORQUE SCREWDRIVER-NUTRUNNER

with the One-Shot Clutch

An air-driven torque screwdriver-nutrunner that can be set to run screws and nuts to specified torque — that's the CP One-Shot "Magnamatic." The Alnico magnetic One-Shot clutch, adjustable to specified torque, disengages completely the instant the fastener is driven to desired tightness. And "Magnamatic" is quiet — the clutch does not impact or ratchet. It maintains the selected torque setting indefinitely — prolongs clutch jaw life. Inexperienced operators don't burr screw heads, strip threads, shear fasteners, or damage work. Screw bits last longer.

CAPACITIES: #4 screws to ⅜" bolts. Reversible and nonreversible types.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

American Air Filter of Canada, Ltd., Montreal, P. Q.

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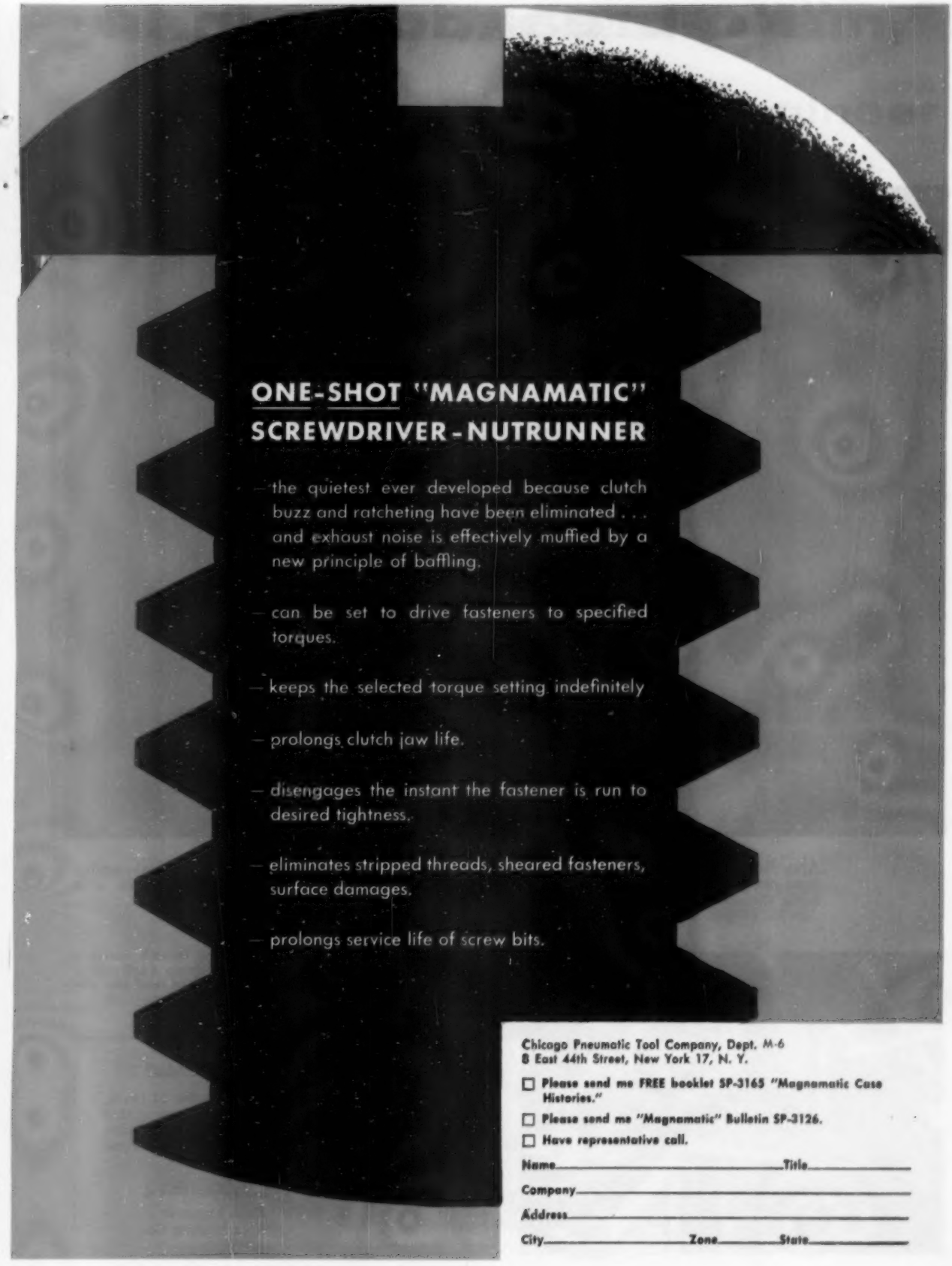


ONE-SHOT "MAGNAMATIC" SCREWDRIVER-NUTRUNNER

— the quietest ever developed because clutch buzz and ratcheting have been eliminated . . . and exhaust noise is effectively muffled by a new principle of baffling.

— can be set to drive fasteners to specified torques.

— keeps the selected torque setting indefinitely

— prolongs clutch jaw life.

— disengages the instant the fastener is run to desired tightness.

— eliminates stripped threads, sheared fasteners, surface damages.

— prolongs service life of screw bits.

Chicago Pneumatic Tool Company, Dept. M-6
8 East 44th Street, New York 17, N. Y.

☐ **Please send me FREE booklet SP-3165 "Magnamatic Case Histories."**

☐ **Please send me "Magnamatic" Bulletin SP-3126.**

☐ **Have representative call.**

Name _____ **Title** _____

Company _____

Address _____

City _____ **Zone** _____ **State** _____

"No breakdown in 14

says

Ajax Electric Salt Bath Furnace, interior view from end. Main roller chain drives lie parallel along furnace bed. Nine separate transfer chain drives (attached to visible sprockets) convey fixture carriers from bath to bath, each at a fixed speed which varies with each step.

(Left) Workman inspects processing baths beneath conveyor system of Ajax Electric Salt Bath Furnace. Nearly a half mile of roller chain drives keeps materials moving with clock-like precision through the various steps of the process.

"Morse gives us excellent results"

"We've worked with Morse Chains for 14 years, and have never experienced a breakdown of this product during that period. And, in our complex installations of electric salt bath furnaces, Morse is giving us excellent results."

Philip H Attwood

Field Engineer
Ajax Electric Co.,

years with Morse Chain,"

Ajax Electric Company Engineer

Ajax Electric Salt Bath Furnaces point up how roller chain can save you on operating costs, cut your downtime, give you flexible, dependable power.

The Ajax Electric Co., Philadelphia, manufactures custom electric salt bath furnaces, used to temper metals used by the automotive and metalworking industries. These furnaces, which automatically transfer materials through as many as nine separate processes, use roller chain for power transmission.

Alkali cleaner, molten salt, steam—all are used in the process. Each is a potential threat to the more than 2000 feet of roller chain used in one of these Ajax furnace lines.

Operator hangs metal parts to be "martempered" in Ajax furnace line on fixture holder. Chain and sprockets in foreground point out ease of adjustment. By changing sprocket diameter, or addition or removal of links, timing of drive can be altered at any time.

Yet for 14 years, drives like these have performed efficiently and dependably, *with not a single breakdown.* (Read statement on left page.)

Morse Roller Chain instantly adaptable

Ajax furnaces involve timed "dips" of the metal parts to be hardened. These periods will vary. By simply changing the number of links in a chain drive, or the diameter of the sprockets, each step in the process can be speeded up or slowed.

You, too, can get the same type of superior power transmission with Morse Roller Chains. Precision-made in all standard sizes and pitches. A wide variety of standard and special-purpose attachments are available to meet specialized requirements.

Literature, engineering help FREE

Write today for Catalog C51-50, or free consultation on your power transmission problems. Morse has skilled engineers available to help you solve practically any problem involving transmission equipment: Roller Chain, Hy-Vo Chain, Silent Chain, Sprockets, Clutches, and Couplings.

Check these advantages of Morse equipment:

- √ Long service life
- √ Low operating cost
- √ Easy to assemble, disassemble
- √ Requires minimum maintenance
- √ Wide ranges of types and sizes
- √ Precision construction

MORSE CHAIN COMPANY • INDUSTRIAL SALES DIVISION • ITHACA, NEW YORK

MORSE BW **CHAINS, CLUTCHES, AND COUPLINGS**

COLLECT IT

AS IT ACCUMULATES — SOLIDS, POWDERS, SLUDGE, LIQUIDS
RAW MATERIALS, FINISHED PRODUCTS, WASTE MATERIALS

Heavy waste is dumped into an open container at a foundry in New York. The first step in the LOAD LUGGER SYSTEM of materials handling is to place a number of containers at strategic points to collect material as it accumulates, reducing handling at the point of origin.

Light material accumulates in an open container with high sides at a shipping carton plant in Louisiana. Rugged LOAD LUGGER containers are built of welded steel, have deep leak-proof bottoms, hold from 1½ to 14 cubic yards and more, and handle all types of material.

It is easy to load this 14-cubic-yard LOAD LUGGER container of a St. Louis contract hauler. It fills to the top without raking and is wind-proof and rat-proof. A model with rubber seals and latches is also theft-proof, fly-proof, dust-proof, and almost odor-proof.

PICK IT UP

ALREADY LOADED — NO LOST TIME AND NO LOADING CREWS
LET ONE TRUCK AND DRIVER DO IT ALL — REPLACING MANY

A full container is picked up at a refinery in Indiana. The second step in the LOAD LUGGER SYSTEM is for one driver and his truck equipped with a hoist-body to pick up full containers on a regular schedule. This procedure does away with lost time and loading crews and eliminates the need for several conventional trucks and their drivers.

A bearing manufacturer in Ohio picks up a full container of dolomite. LOAD LUGGER hoist-bodies (flat-bed truck bodies with a pair of hydraulic-powered hoisting arms) handle pay loads of up to 18,000 pounds and more. They are easily mounted on any truck chassis of suitable capacity, and all controls are installed in the cab.

An open container used for accumulating industrial wastes is picked up by a Chicago contract hauler. For greater safety, LOAD LUGGER hoist-bodies lift containers with four-point suspension and have double-acting hydraulic cylinders for positive control at all times.

LOAD LUGGER®

* FLAT-BED TRUCK BODIES WITH HYDRAULIC HOISTING ARMS
* LEAK-PROOF TILT-DUMP CONTAINERS FOR BULK MATERIALS

ENGINEERING B-W PRODUCTION

GMC Research Triumph — An Entirely

HAUL IT

IN MANY TYPES OF CONTAINERS — OR ON THE TRUCK BED IN PLANT AND OVER THE ROAD — ON YOUR TRUCK CHASSIS

A city truck in Ohio hauls a full container of repair materials. Government approval is evidenced by the many such municipal, state, and federal installations. Hauling full containers is the third step in the LOAD LUGGER SYSTEM, and over-the-road hauls are as feasible as in-plant because of the use of standard truck chassis.

A full container of residue materials is hauled at a corn products processing plant in Illinois. LOAD LUGGER hoist-bodies carry containers well forward for correct load distribution and cradle them between steel sidewalls for greater travel safety.

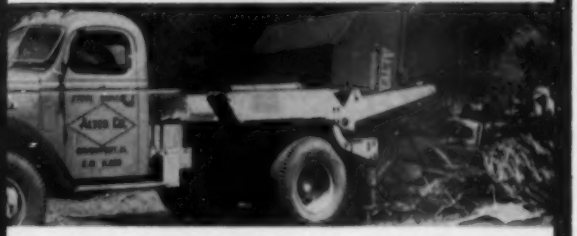
LOAD LUGGER hoist-bodies also carry materials or equipment directly on their flat beds, loading and unloading heavy objects with their hoisting arms.

This special hoist-body of a Michigan telephone company transports heavy cable reels. Such new uses for LOAD LUGGER equipment are constantly being developed.

DUMP IT

BY TILTING CONTAINER VERTICALLY OVER REAR APRON, OR DELIVER IT BY EXCHANGING FULL CONTAINER FOR AN EMPTY

Spent solvents are dumped into incinerator tank at a drugs and medicines manufacturing plant in Michigan. Delivering full containers or dumping their loads is the fourth step in the LOAD LUGGER SYSTEM. Returning empty containers then completes the cycle.



Metal scrap is dumped and spread in the yards of a scrap metals service company in Iowa. LOAD LUGGER hoist-bodies handle more pay load on a given truck chassis, because they are lighter than comparable equipment. And their patented simplicity, clean design, and sturdy construction make them cost less to buy and maintain.

Equipment of a Miami contract hauler in the dumping position. The LOAD LUGGER hoist-body has outrigger jacks to protect rear springs and axles from injury while picking up and putting down heavily loaded containers, but it neither needs nor uses these jacks while tilting container over rear apron to dump or spread the load.

ENGINEERED, MANUFACTURED, AND MARKETED BY

Ingersoll

KALAMAZOO DIVISION

SUCCESSOR TO BROOKS EQUIPMENT & MFG. CO.

BORG-WARNER CORPORATION

EXPORT SALES: BORG-WARNER INTERNATIONAL CORP., CHICAGO

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New Type Of Soap That's Almost

SBS Research Triumph... An Entirely IMPOSSIBLE

UNLIKE ANY OTHER SOAP that is to be used with water, SBS-60 Cream Deodorant Soap is neither a liquid, bar, nor powder . . . but a white, opaque, thick-bodied cream. It is economically dispensed on the hands with no loss and is, for all practical purposes, impossible to waste! The SBS-60 Cream Deodorant Soap dispenser need not be placed over the washbowl or in the shower like liquid or powdered soap equipment. In fact, it can be placed anywhere in the washroom area. SBS-60 Cream Deodorant Soap is dispensed on the hands before wetting and may be spread on the skin enroute to the washing facility without loss! One SBS-60 dispenser can serve many users for both hand washing, or showers, with absolute assurance of no soap waste . . . no soap spillage . . . no costly dispenser maintenance. Carefully cost-checked; SBS-60 Cream Deodorant Soap has achieved savings in soap costs of up to 50% in typical plants across the country.

New Type Of Soap That's Almost

TO WASTE!

SBS-60

CREAM DEODORANT SOAP

SUCCESSOR TO LIQUID AND BAR SOAPS

Presenting the first major soap development in a quarter of a century . . . savings on soap costs up to 50% assured

The announcement of SBS-60 Cream Deodorant Soap once and for all solves the problem of costly waste in the use of liquid and bar soaps. Today for the first time, the availability of SBS-60 Cream Deodorant Soap brings costly soap waste to an end for your company. Three years of extensive laboratory testing and country-wide plant tests have proved the value of SBS-60. Savings up to 50% in soap costs are matters of record . . . an end to costly soap dispensing problems is assured . . . improvement in employee morale is another handsome dividend when SBS-60 is used. Special announcement literature has been prepared to answer all your questions . . . this information is valuable to you and your company—send for it now.

MODERN LABORATORY EQUIPMENT in the hands of skilled chemists produced this first major soap development in decades . . . SBS-60 Cream Deodorant Soap. Their assignment was to come up with a product that would eliminate the wastes of present day liquid and bar soaps . . . their success is now a matter of recorded fact.

SEND FOR YOUR COPY OF THIS SPECIAL ANNOUNCEMENT LITERATURE

SUGAR BEET PRODUCTS COMPANY, 302 WALLER ST., SAGINAW 47, MICH.

Gentlemen: Rush me the special announcement literature on the new SBS-60 Cream Deodorant Soap.

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TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

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Chemical By-Products Division
302 Waller St., Saginaw, Mich.

Canadian Subsidiary
Chemical By-Products, Ltd.
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Any hose assembly made in 3 minutes

RIGHT IN HIS OWN SERVICE SHOP!

Now, for the first time, your Weatherhead distributor offers you complete swaged hose assembly service right in his own shop. No waiting for shipments of factory-finished hose assemblies. No need for costly downtime and delay Equipped with the new Weatherhead swaging press and the complete line of Weatherhead hose and hose ends, your distributor is prepared to supply you with any size, type and length hose assembly at once.

Wherever you are, whatever your need, there is a Weatherhead distributor strategically located to give you immediate stand-by swaged hose assembly service.

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The Weatherhead Company, Fort Wayne Division, Dept. G-11, 128 West Washington, Fort Wayne, Indiana

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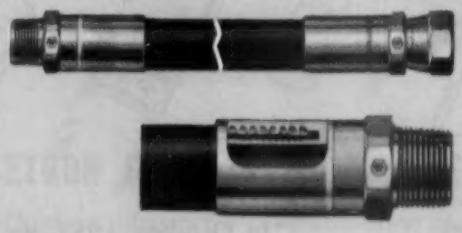
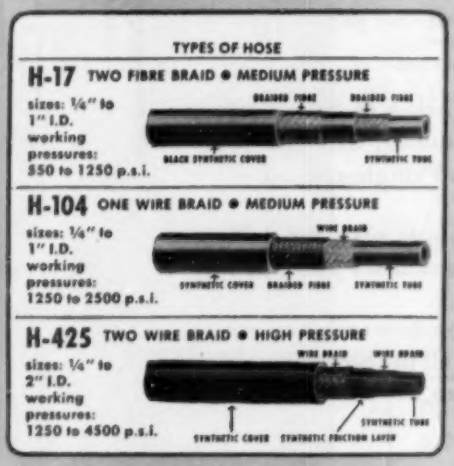
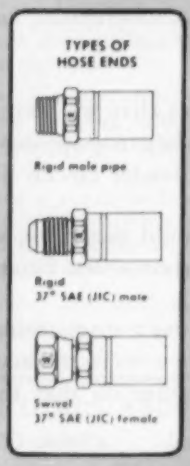
WEATHERHEAD DISTRIBUTORS

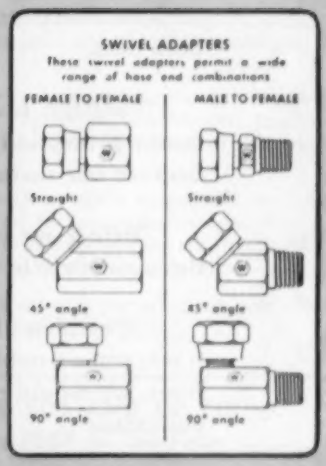
WEATHERHEAD—Your Only Complete Single-Source Hydraulic Hose and Fitting Line. Any industrial hose for any need—low, medium-high and high-pressure applications; available in complete size ranges to 2″ I.D.; suited for any service condition.

Weatherhead swaged hose assemblies match factory-made assemblies in every respect. They're available in any quantity, length, type or size to meet your needs and at no additional cost to you. Take advantage of your local Weatherhead distributor's dependable RIGHT-NOW swaged hose assembly service. Another Weatherhead first . . . component parts for hydraulic hose lines.









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Send for full details TODAY!

The Weatherhead Co., Fort Wayne Division
128 West Washington, Fort Wayne, Indiana

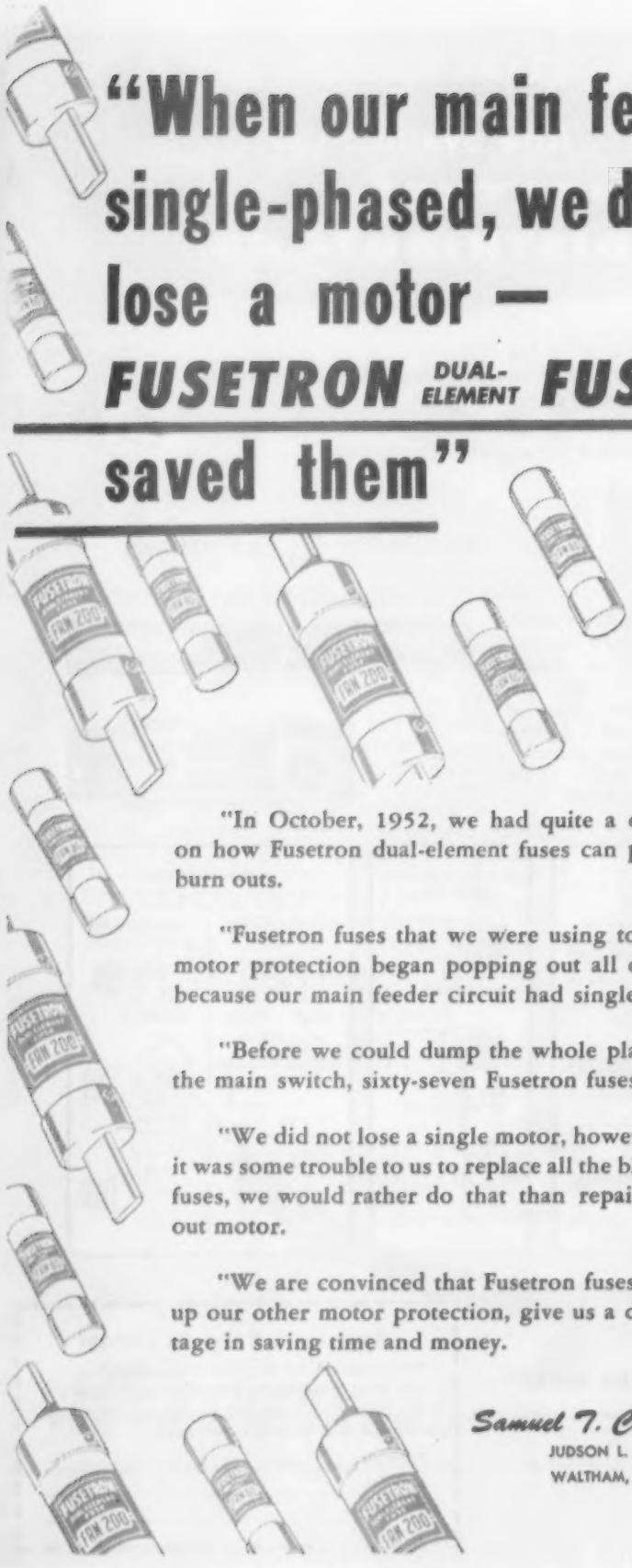
Send full details on your Distributor's Stand-by Swaged Hose Assembly Service.

Company _____

Address _____

Your Name _____

"When our main feeder single-phased, we did not lose a motor — FUSETRON DUAL-ELEMENT FUSES saved them"



"In October, 1952, we had quite a demonstration on how Fusetron dual-element fuses can prevent motor burn outs.

"Fusetron fuses that we were using to back up our motor protection began popping out all over the plant because our main feeder circuit had single-phased.

"Before we could dump the whole plant by pulling the main switch, sixty-seven Fusetron fuses had opened.

"We did not lose a single motor, however, and while it was some trouble to us to replace all the blown Fusetron fuses, we would rather do that than repair one burned out motor.

"We are convinced that Fusetron fuses used to back up our other motor protection, give us a distinct advantage in saving time and money.

Samuel T. Craig CHIEF ELECTRICAL ENGINEER
JUDSON L. THOMSON MANUFACTURING CO.
WALTHAM, MASSACHUSETTS

FUSETRON dual-element FUSES DO MORE THAN PROTECT MOTORS AGAINST BURNOUT DUE TO SINGLE PHASING

. . . *They provide 10 Point Protection*

1. High interrupting capacity — protect against heaviest short-circuits. Have proven on tests to open safely on circuits set to deliver in excess of 100,000 amperes.

2. Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation.

3. Protect against needless blows caused by harmless overloads.

4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.

5. Protect against waste of space and money — permit use of proper size switches and panels.

6. Protect motors against burnout from overloads.

7. Give DOUBLE burnout protection to large motors — without extra cost.

8. Protect motors against burnout due to single phasing.

9. Make protection of small motors simple and inexpensive.

10. Protect coils, transformers and solenoids against burnout.

AND FUSETRON FUSES REMAIN SAFE

without maintenance and recalibration costs

Once properly installed, Fusetron fuses require no costly inspection time or maintenance necessary on mechanically operated devices.

Dust, fumes, corrosion or age cannot prevent a Fusetron fuse from opening safely. There are no hinges, pivots or contacts to stick or slow down the operation of the fuse on short-circuit.

When a Fusetron fuse does open to protect, and after the fault has been corrected — the new Fusetron fuse you install has been calibrated at the factory by engineers — it is a fuse as safe and dependable as the one that blew.

Blowing time charts and more information are available on Fusetron dual-element fuses. Write for bulletin FIS.

FOR LOADS ABOVE 600 AND UP TO 5,000 AMPS . . . *Use BUSS Hi-Cap Fuses*

On 600 volts or less, they have interrupting capacity sufficient to handle any fault current regardless of system growth.

When coordinated with Fusetron fuses they will not open ahead of fuse nearest fault.

— Write for bulletin HCS —

Play Safe! *Install FUSETRON Fuses and BUSS Hi-Cap Fuses throughout entire Electrical System!*

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

113

BUSSMANN Mfg. Co. *Division of McGraw Electric Co.*
University at Jefferson, ST. LOUIS 7, MO.

YALE KGA 51 SERIES.....

YALE *Torque Transmission*

[FULLY AUTOMATIC]

Specifically designed for the KGA 51 Series of Yale Industrial Lift Trucks, the Yale Torque Transmission through torque conversion provides the best all-purpose means of attaining "POWER WHEN NEEDED."

... THE SMOOTHEST HANDLING LIFT TRUCK EVER BUILT

Modern passenger car ease and safety...
automatic response to every power demand with

YALE *Torque Transmission*

[FULLY AUTOMATIC]

Automatic Power Control. Engineered exclusively for the KGA51 series, the YALE Torque Transmission matches power to power demand ...applies the necessary power at the moment it's needed for starting or climbing grades under all load conditions.

Fully Automatic Transmission. Simplified controls increase operator efficiency, reduce operator fatigue. No clutch pedal or shifting of gears. Only two drive controls—accelerator and directional control lever.

Inching Control. Smoother and more accurate maneuvering of the truck is permitted at times when high engine speeds are required to perform faster lifting or an attachment operation.

Longer Truck Life. "Cushioned Action" of Yale Torque Transmission reduces vibration and shock loading with less wear on moving parts.

Increased Operator Efficiency. Lowered cowl affords maximum visibility with operator protection. Improved safety and comfort offered by lowered seat.

Versatility. Available in capacities from 3000 to 8000 lb....Gas, Diesel, or LP-Gas powered ...cushioned or pneumatic tires.

FREE, FACT-FILLED BOOKLET

This informative color booklet includes cut-away of the KGA51 Truck—shows why this is the smoothest handling lift truck ever built. Write: The Yale & Towne Manufacturing Co., Roosevelt Boulevard, Philadelphia 15, Pa., Dept. 311

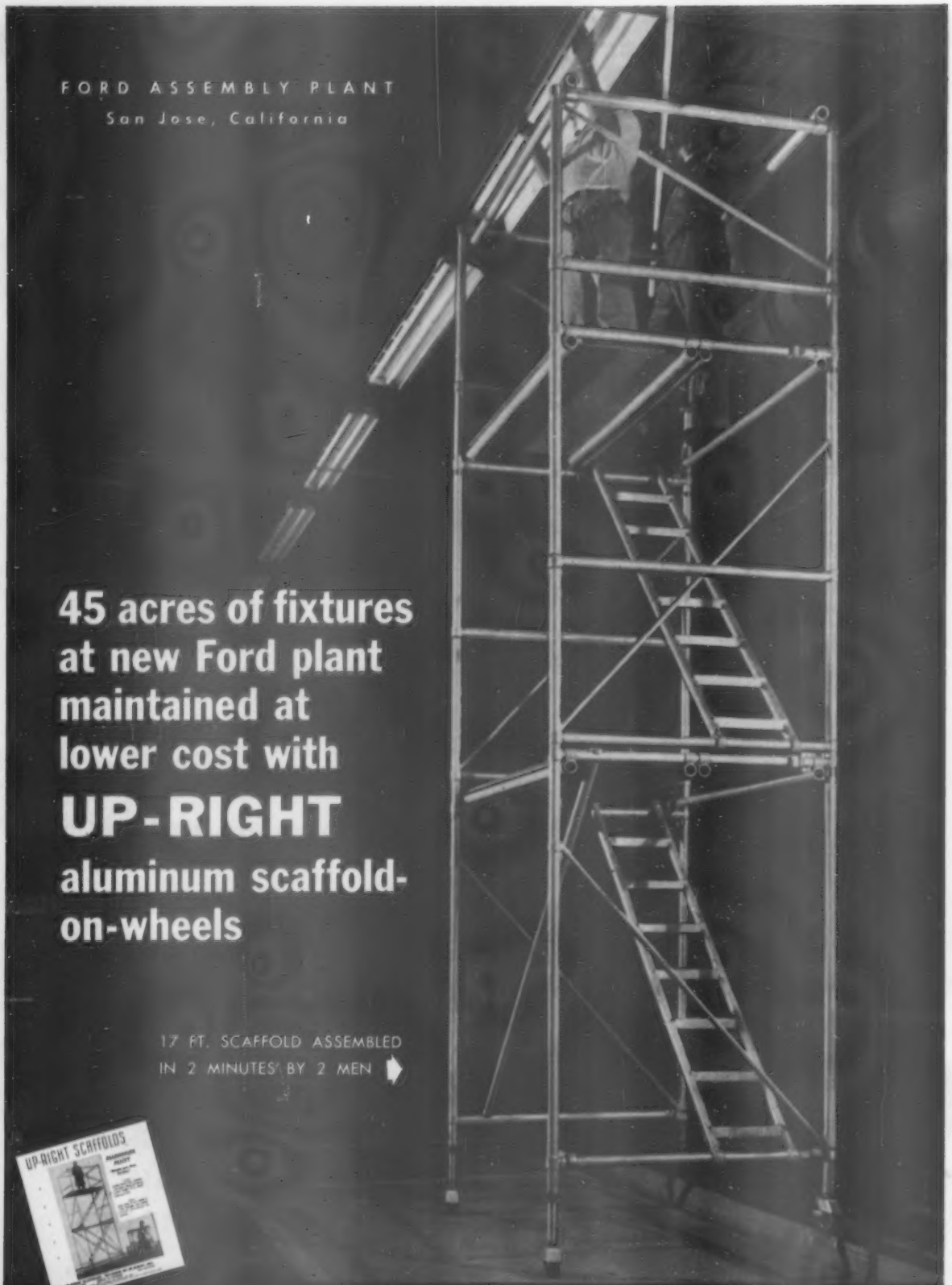
YALE*

INDUSTRIAL LIFT TRUCKS AND HOISTS

Gas, Electric, Diesel, LP-Gas Industrial Lift Trucks
Worksavers • Warehousers • Hand Lift Trucks
Hand and Electric Hoists

*Reg. U. S. Pat. Off.

FORD ASSEMBLY PLANT
San Jose, California



45 acres of fixtures at new Ford plant maintained at lower cost with

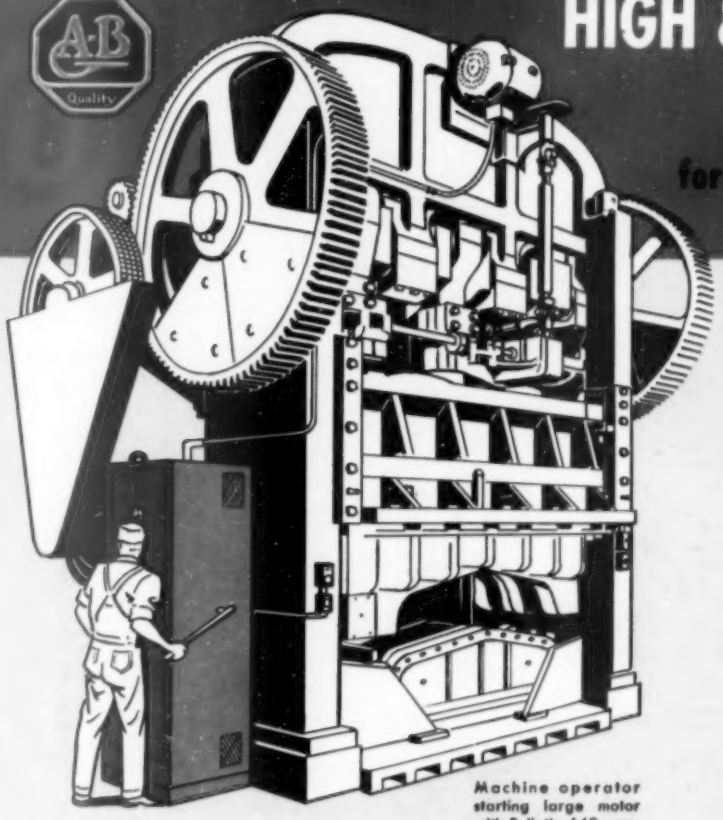
UP-RIGHT

aluminum scaffold-on-wheels

17 FT. SCAFFOLD ASSEMBLED IN 2 MINUTES BY 2 MEN

You, too, can save with these rapidly assembled Up-Right aluminum scaffolds.
Write for circular • Up-Right Scaffolds • Dept. 161 • 1013 Pardee St., Berkeley, Calif.

HIGH & LOW VOLTAGE STARTERS for BIG MOTORS



Machine operator starting large motor with Bulletin 640 manual velvet smooth resistance starter. Starting jolts are eliminated.

BIG STARTERS for big motors . . . for 220-440-550 volts . . . for 2000 to 2500 volts . . . and for 2501 to 4600 volts . . . are catalog listed units in the Allen-Bradley line. Illustrated below is a limited variety of starters for squirrel cage, wound-rotor, and synchronous motors. Starters for manual or automatic operation are available. Starters for 600 volts or less are available in ratings up to 600 hp. High voltage starters are rated up to 1500 hp.

Write for a copy of the Allen-Bradley Handy Catalog in which all varieties of "big starters" are listed. It is also a handy buyer's guide on the latest developments in controls and accessories.

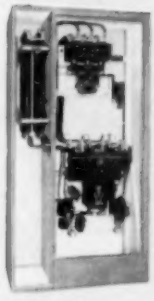
Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wisconsin

In Canada
Allen-Bradley Canada Ltd., Galt, Ont.

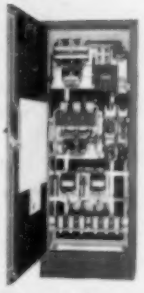
ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

A FEW OF THE BIG STARTERS IN THE ALLEN-BRADLEY LINE

Bulletin 646 manual autotransformer type starter

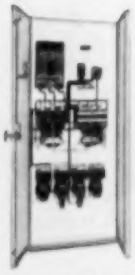


Bulletin 740 automatic reduced voltage motor starter



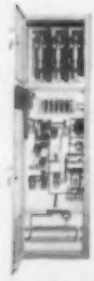
Bulletin 742 automatic starter—velvet smooth acceleration

Bulletin 746 automatic autotransformer type starter

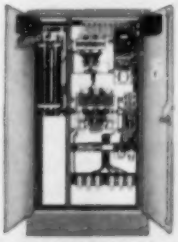


Bulletin 761 automatic wound-rotor motor starter

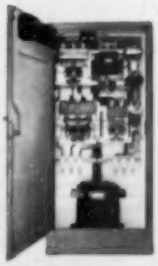
Bulletin 906 across-the-line synchronous motor starter



Bulletin 906 high voltage synchronous motor starter

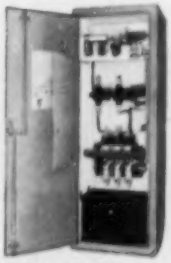


Bulletin 914 reduced voltage synchronous motor starter



Bulletin 922 low voltage synchronous motor starter

Bulletin 922 high voltage synchronous motor starter

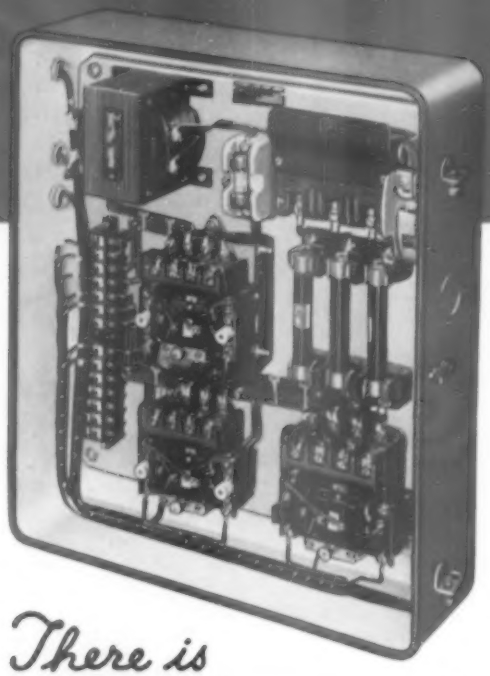


Bulletin 1109 high voltage across-the-line starter

Bulletin 1146 high voltage squirrel-cage motor starter

9-55-MR

Oakes mixing machine for continuous mixing of raw materials in the rubber and chemical industries.



Close-up of Allen-Bradley automatic motor control panel.

The Sign of QUALITY MOTOR CONTROL

Service-tested Components for Automation Control Panels

Reversing Switch | Solenoid Starter | Multispeed Starter

Solenoid Relay | Pilot Switch | Drum Switch | Pneumatic Timer

Pressure Switch | Zero Speed Switch | Limit Switches

There is

SALES VALUE for YOU in the A-B TRADEMARK

Time has established the A-B trademark as the sign of Quality in motor controls. It is so recognized by the buyers of your motorized machines. So, why not standardize on Allen-Bradley controls.

Years and years of trouble free service in every conceivable industry has proved conclusively that A-B controls are a real sales asset to any machine. You just cannot beat Allen-Bradley controls for simplicity in design . . . your guarantee for reliable and consistent performance.

Whether you need a single starter or an all-inclusive special control panel, call in your nearest Allen-Bradley sales engineer. Let him recommend the components that will assure the most continuous output from your machines.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wisconsin

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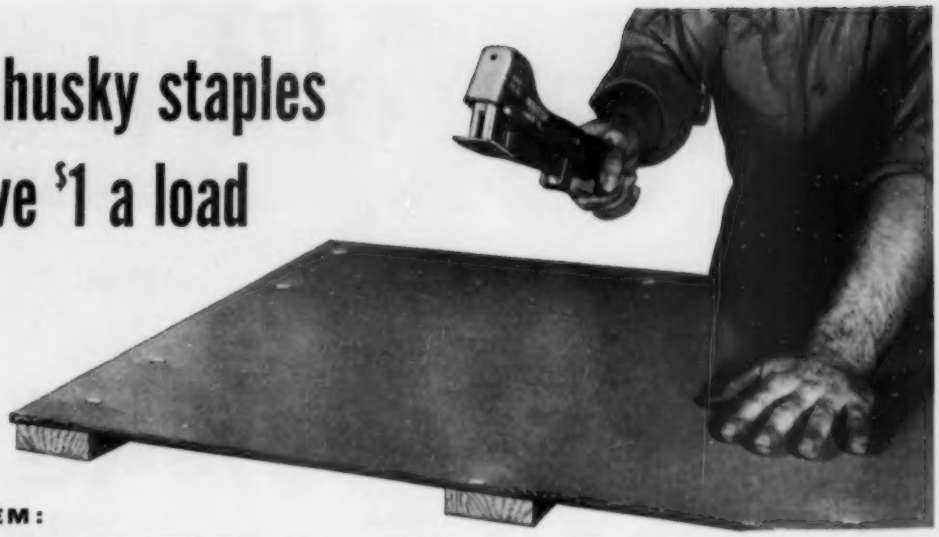
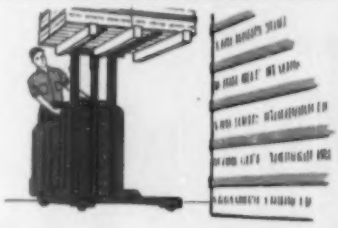
ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

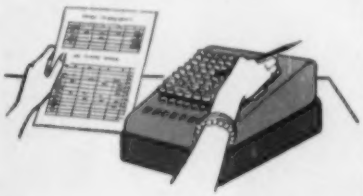
How 16 husky staples help save $1 a load



THE PROBLEM:



In a leading paper mill, heavy printing stock was moved on mill pallets by lift truck. Such wooden platforms were so costly for customers that often cartons had to be hand-loaded.

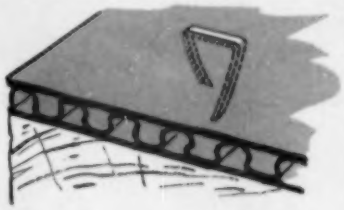


Too, not all customers used lift equipment. Many objected to paying extra for "useless pallets." Orders from these customers meant special handling, added expense.

The problem: find a way to keep handling costs down on all orders. Could stapling be the answer? Bostitch had helped cut costs on other jobs in the mill—why not this one, too?

THE SOLUTION:

A Bostitch Economy Man and the mill's engineers worked out the answer—a "give-away" pallet: corrugated board quickly stapled to scrap lumber with a Bostitch H4 Hammer.



Four small wood strips raise the load just enough for lift truck chisel forks to slip under. Sixteen ¼" heavy-duty Bostitch staples secure strips. Boxed load supports itself between forks.

Entire pallet costs less than 40c. Customers get pallets free, save handling when unloading. The mill saves pallet storage space and hundreds of dollars in handling, billing and salvage costs.

How much can you save by switching to Bostitch? Your Bostitch Economy Man will work out answers for you without cost. He's one of 375 trained fastening specialists working out of 123 cities in the U. S. and Canada. Over 800 kinds of Bostitch staplers for business and industry. Look for "Bostitch" in your telephone directory. Or mail coupon.

Fasten it better and faster with

BOSTITCH
STAPLERS AND STAPLES

BOSTITCH, 611 Mechanic Street, Westerly, R. I.

You say you can save my company money on fastening costs. Okay, prove it!

Name _____

Company _____

Address _____

City _____ *Zone* _____ *State* _____

40 Years of Progress.

1914— **Carrier**

1919— **Trucktractor**

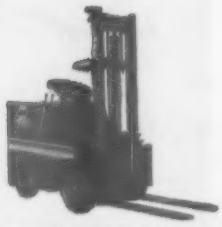
1923— **Truclift**

1924— **Dust**

1941— **Gas Clipper**

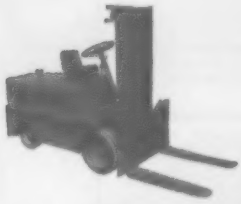
1942— **Electric Carloader**

1946— **Gas Trucloader**



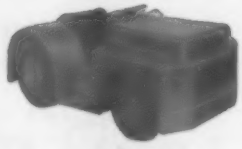
1946— **Electric Trucloader**

1949— **Clarkette—5**



1950— **Dynatork Utilitruc—100**

1950— **Yardlift—150**

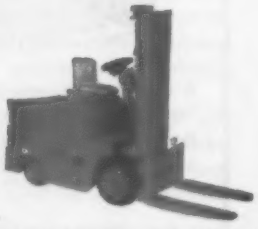


1951— **Clarktor—120**

1953— **Yardlift—260**

1954— **Yardlift—200**

1954— **Clarktor—75**

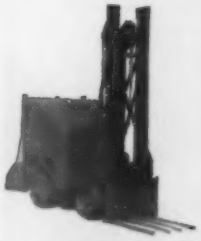


1954— **Explosion-Proof Carloader**

Many of these machines were developed to meet specific customer requirements . . . and subsequently became the standard of entire industries.

DEVELOPMENT • DESIGN • ENGINEERING

- making good machines better

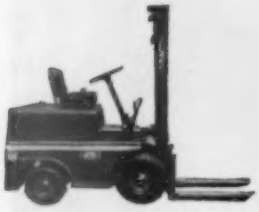


1928— Tructier

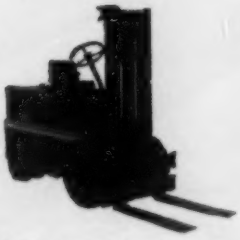
1928— Clarktor

1938— Gas Carloader

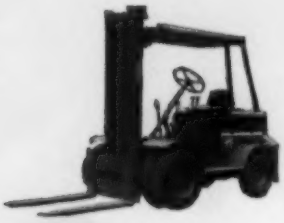
1939— Gas Utilitruc



1947— Yardlift—20



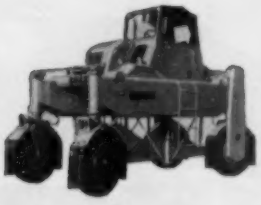
1947— Yardlift—40



1948— Yardlift—60

1948— Dynatork Utilitruc

1952— Yardlift—100



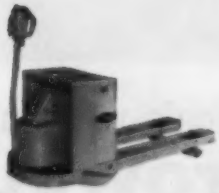
1952— Series 81 Carrier

1953— Hydratork Utilitruc

1953— Utilitruc (stevedoring spec.)

1954— Electric Clarkat

1954— LP Gas Carloader



1954— Powr' Hand Truck

1954— Yardlift 20 Scoop

Industrial Truck Division

CLARK EQUIPMENT COMPANY

Battle Creek 19, Michigan

APPLICATION · SERVICE

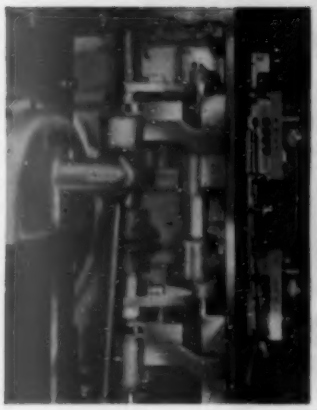
CLARK EQUIPMENT

First with America's railroads

NIBROC® TOWELS ... first wet strength towel

and still the finest ... Strong the way you like them ... yet super-absorbent—sanitary—soft-textured. Nibroc Towels match the dependable service of your railroads, which use more of them than any other paper towel. It's just the same with most industries and many institutions. Buy the finest—Nibroc Towels and Nibroc Sofwite or Softan Toilet Tissues. For name of distributor, see "Nibroc" in your classified directory or write Brown Company, Dept. NC-11, 150 Causeway Street, Boston 14, Mass.

His Royal Nibs

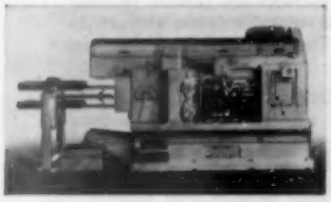


Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

- Models 2⅝" LA, 3½" AD, 5" KL, and 5¼" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

  Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

  All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in 9/16", 1" and 1⅝" sizes. Write, wire, or phone for literature.

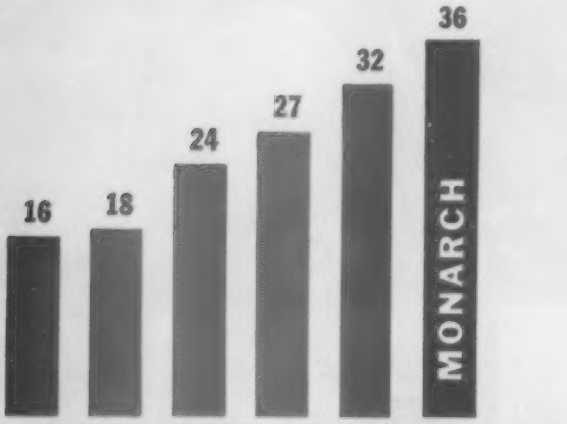


Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

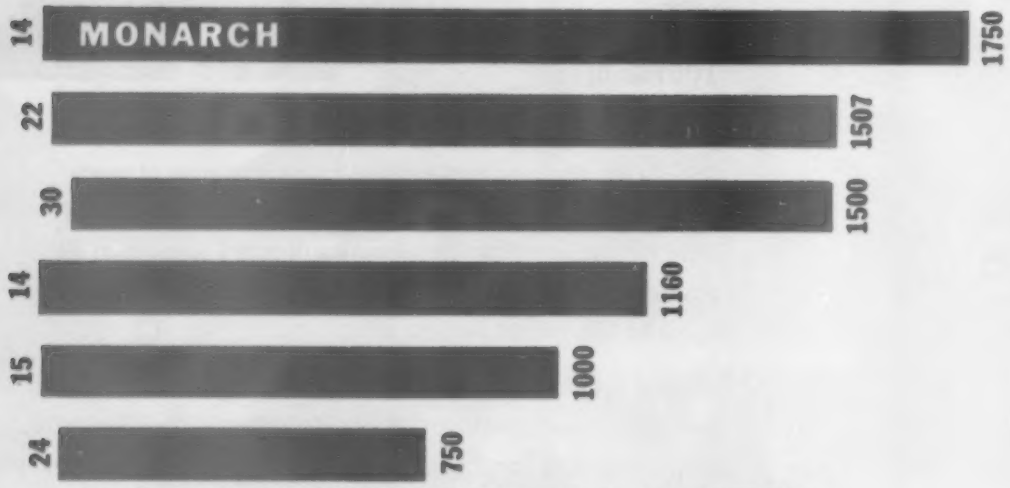
TALK ABOUT SPEEDS!

There's No Matching the Monarch Preselector Dyna-Shift



THE MOST SPEEDS–36

Unique Speed PRESELECTOR DYNA-SHIFT



UNEQUALED RANGE–14 to 1750

Surface Cutting Speed! These three words are the key to top efficiency in the operation of *any* lathe.

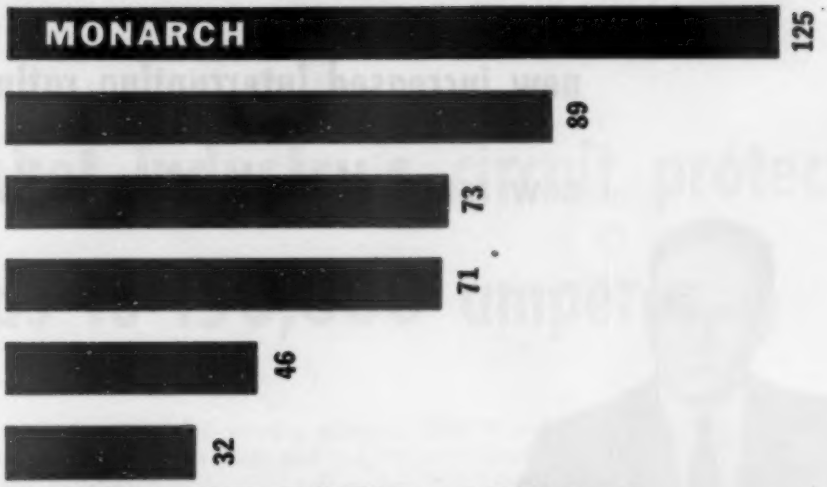
Certainly it's true, you say. But why bring that up? Because only now is a lathe available to give you, practically the correct surface speed, diameter after diameter, piece after piece. That lathe is the new Monarch Series 62 Preselector Dyna-Shift.

It has 36 speeds in a range of 14 to 1750 RPM. Headstock ratio is 125 to 1. And it has *speed preselection.* Here at last is a machine with a standard speed range low enough, high enough and with plenty of speeds in between to make unnecessary a whole assortment of special ranges. With this one standard range you have the power to turn efficiently any part within the work capacity of the lathe.

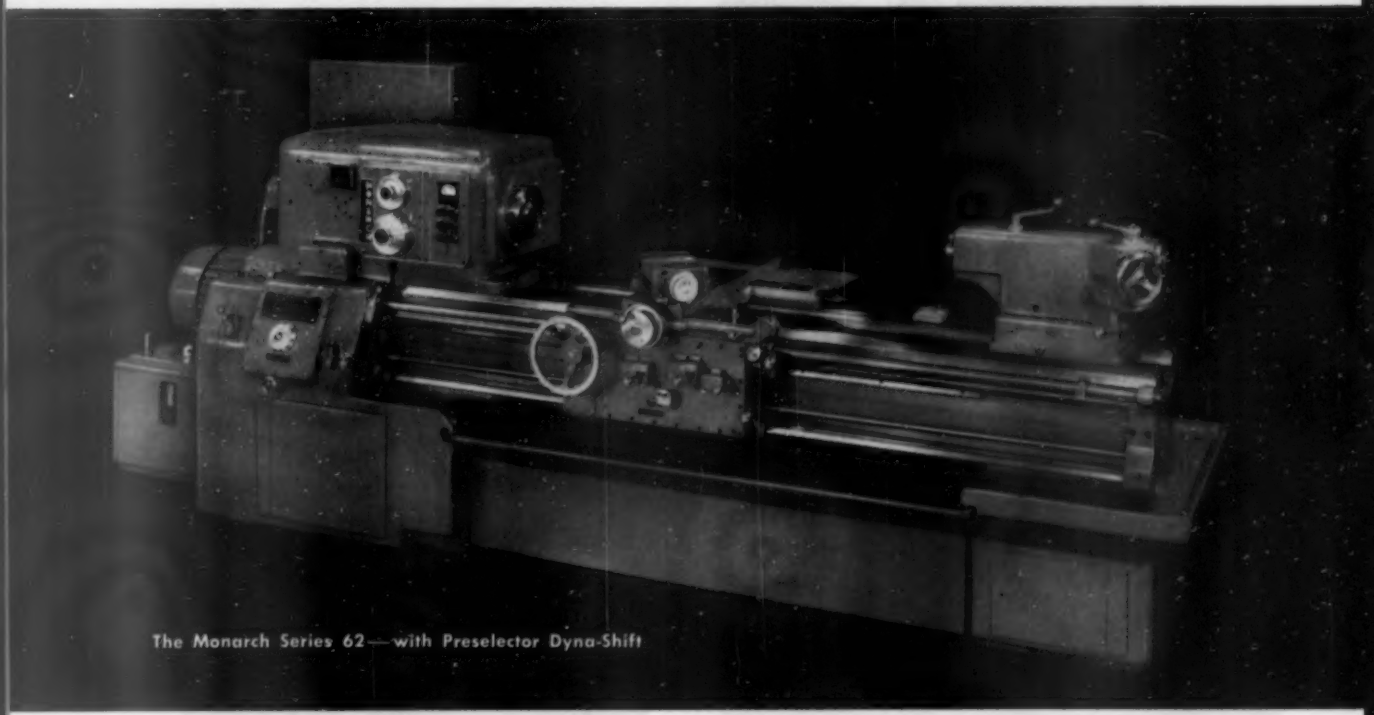
The Dyna-Shift feature makes it unnecessary for the operator ever to figure the R.P.M. he needs for the desired surface speed. He never has to be a calculating machine. He never has to get bleary-eyed figuring a lever setting combination from a complex index plate. He never has to be a color matcher. He never has to set a series of levers in a variety of positions as indicated by the index plate.

All he does is set two large dials on the Preselector Dyna-Shift—one for the work diameter to be turned, the other for the surface speed needed. The machine calculates the necessary R.P.M. and makes the shift automatically. With the preselection feature he may preset up to 6 or more different diameters and set up the shift for each while the machine is turning the previous diameter.

Nowhere but on the Monarch Series 62 Preselector Dyna-Shift can you get this combination. And no other machine can be kept under full load during the entire machining cycle for the utmost in metal removing efficiency. There's an area of cost reduction you cannot afford to overlook any longer. Ask us about it. ***The Monarch Machine Tool Co., Sidney, Ohio.***



GREATEST RATIO–125 to 1



The Monarch Series 62—with Preselector Dyna-Shift

PRODUCTION PLUS

The Monarch Series 62

Increases Productivity up to 25%*
Increases Tool Life up to 50%*

**Figures based on studies comparing step shaft output of Preselector Dyna-Shift with that of a conventional 16-speed headstock lathe.*

Monarch
TURNING MACHINES

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen:

☐ I am interested in your Series 62 story. Please send me your illustrated Booklet #1505 with complete data.

☐ Please have a Monarch sales engineer call on me.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

2 new L. V. circuit breaker frame sizes . . .

new increased interrupting ratings . . .

new range of applications . . . . . .

With L. L. Fountain here are the two new Westinghouse DB breakers for low-voltage power distribution, with interrupting capacity up to 150,000 amperes.

blanket industry's circuit protection needs to 150,000 amperes

1. Two new Westinghouse DB breaker sizes—the DB-75 and DB-100—complete your low-voltage power distribution circuit protection requirements.

2. Interrupting ratings for all five breaker sizes have been increased on 240-volt and 480-volt, nonselective applications (table below).

This means you now get much greater short-circuit and overload protection in the same frame sizes . . . greater interrupting capacity in the same floor area.

3. All Westinghouse DB breakers now are equipped with the exclusive air-delayed overload tripping device with an unexcelled range of optional settings—standard instantaneous and long-time delay with *9 calibrated settings*, or selective tripping units with combinations of long and short-time delay with *13 settings*. This means, for one thing, that you get a greater variety of switchboard and switchgear application possibilities, to meet increasing power needs and changing production situations.

In addition to these new developments, the DB line of breakers incorporates such features as metal bases, individually insulated poles, fully insulated tripping adjustments and maximum accessibility to all components—features that add up to many years of trouble-free circuit protection.

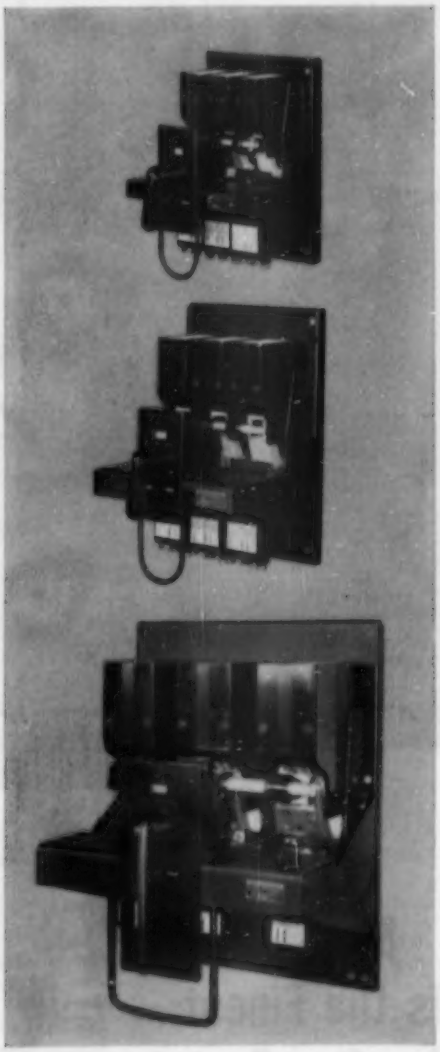
Contact your Westinghouse sales engineer for assistance in circuit breaker application, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60884

Nonselective Application Ratings for DB Breakers

Frame Size	Old Rating	New Rating	
		240 Volt	480 Volt
DB-15	15,000A	30,000A	25,000A
DB-25	25,000A	50,000A	35,000A
DB-50	50,000A	75,000A	60,000A
DB-75	75,000A	100,000A	75,000A
DB-100	100,000A	150,000A	100,000A

YOU CAN BE SURE...IF IT'S

Westinghouse



The DB-15, DB-25 and DB-50 circuit breakers, with their increased I. R. and comparable characteristics, cover the lower ranges of current ratings.

Nothing Like It For "Big Grinder"

SKIL 6"

Why SKIL Model 246 is the Finest You Can Buy:

More safety features at low price! Complete wheel guards, spark arrestors and exhaust chutes.

Fast-Starting statically and dynamically balanced motor gives vibration-free performance. Quiet, cool-running.

Self-lubrication ball bearings give continuous, trouble-free operation—save maintenance time and costs.

SKIL ACCESSORIES THAT GIVE EVEN GREATER SAFETY AND UTILITY!

Features AT LOW COST!

Model 246 Bench Grinder

FOR GRINDING, SHARPENING, BRUSHING OR BUFFING . . . IN ALL PRODUCTION AND MAINTENANCE!

Look at the advantages of this rugged, smooth-running SKIL Bench Grinder. They're usually offered only on bigger, more expensive models. Yet SKIL combines them with outstanding performance and long operating life to bring you the finest light-duty, low-cost grinder you can buy today!

Only SKIL Model 246 Grinder offers all these important big grinder safety features at low price. Wheel guards with end covers, spark arrestors and exhaust chutes, and sturdy, adjustable tool rests. And illuminated eye shields are available as optional accessories for protection and increased visibility.

For safety, for years of dependable, trouble-free service, for all grinding, sharpening, brushing and buffing jobs in the smaller shop. Flat face design permits easier handling of work and lets you reach hard-to-get-at surfaces. Also a favorite for spotting around larger plants to eliminate bottle-necks, save man-hours. Ask your distributor to show you the SKIL Model 246 Grinder now! See for yourself why it's the biggest bench grinder value on the market!

Low SKIL price—Only $58.00

⅓ h.p. 6" SKIL Model 247

Extremely powerful for its size and weight. Has all the safety features and smooth performance of Model 246. For all grinding, sharpening, buffing and wire brush work on production lines, in maintenance and repair shops and tool rooms. **Low Price—Only $68.00!**

Pedestal base for extra convenience! Storage compartment, removable water pot. Optional at small extra cost.

Solid housing of pressure die cast aluminum has maximum strength and rigidity —greater work clearance.

Illuminated Eye Shield protects eyes, increases work visibility. *Price, $12.50 each.*

• Plain Eye Shield for extra safety! ½" shatterproof glass. *Price per pair, $7.00.*

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Made Only by SKIL Corporation formerly SKILSAW, Inc.
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Factory Branches in All Leading Cities

FREE! **Mail coupon for a demonstration and FREE trial. See why SKIL Models 246 and 247 are the finest grinders of their size you can buy *anywhere* today!**

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☐ I would like a demonstration and free trial.

☐ Please send literature on SKIL Models 246 and 247 Bench Grinders.

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Company_____

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LEVER PENDENT CONTROL
(illus.)
also Push-Button or Cable Control

There's a speedy dependable

ARO

PRODUCTION AIR HOIST *to fit your job!*

2,000 lb.
1,500 lb.
1,000 lb.
500 lb.
300 lb.
100 lb.

VARIABLE SPEED . . . 1000 lbs., 0 to 38′ per minute . . . 2000 lbs., 0 to 20′ per minute . . . load can be inched or zipped.

AIR-POWERED FOR SAFETY . . . no spark hazard . . . explosion-proof motor . . . can't burn out . . . can't overheat . . . unaffected by dust or fumes.

LIGHTWEIGHT . . . only 28½ lbs. for 1000 lb. hoist . . . 2000 lb. hoist weighs only 47 lbs. Overall length all models, 10½″ to 11⅛″.

TRY THIS WITH ANY OTHER HOIST!

You can inch so slowly that you can touch an egg without breaking it!

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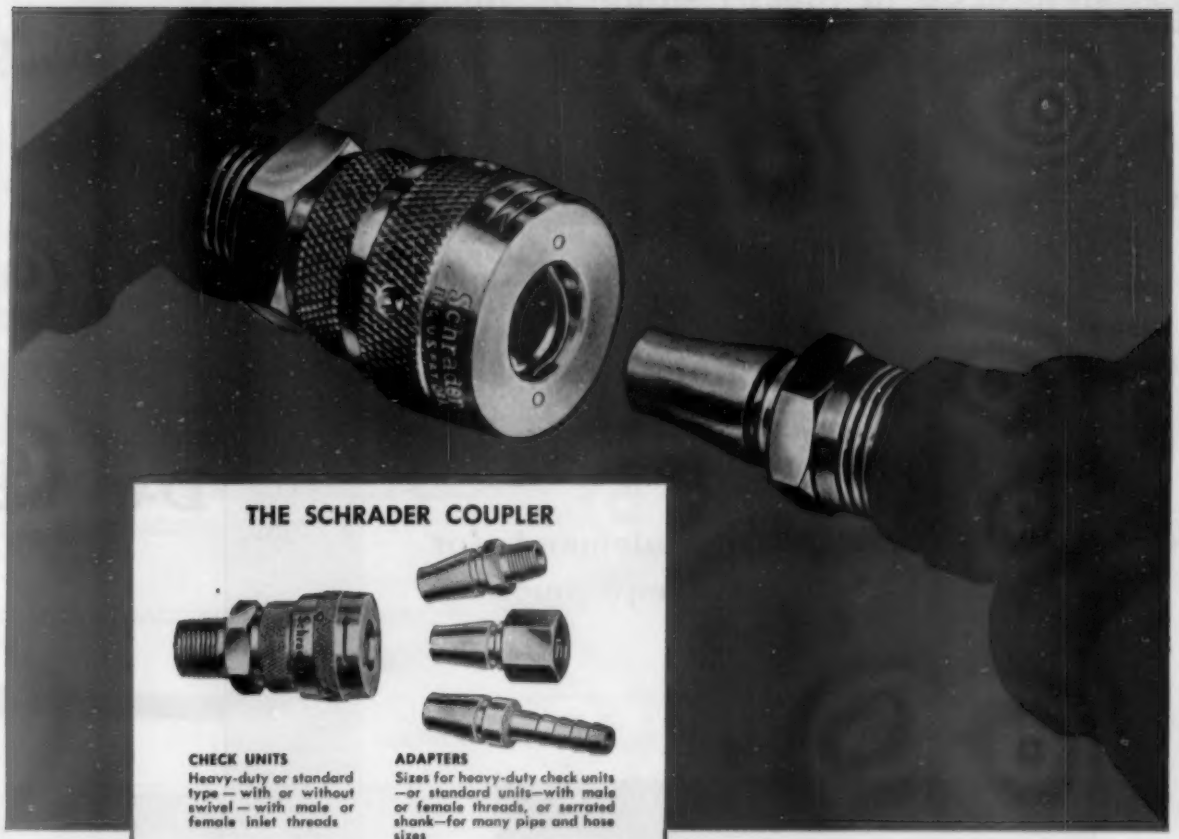
THE SCHRADER COUPLER
CHECK UNITS
Heavy-duty or standard type — with or without swivel — with male or female inlet threads
ADAPTERS
Sizes for heavy-duty check units —or standard units—with male or female threads, or serrated shank—for many pipe and hose sizes

Plug in for air power nearest the job

Spot Schrader Couplers everywhere in your plant—along benches . . . on columns . . . wherever an air outlet means convenience. Schrader Quick-Acting Couplers make air as easy to "plug in" as electric current. Yes, bring air to the job, not the job to the air line—and you'll get greater portability in your air tools . . . eliminate extra lengths of hose and miles of foot steps.

Schrader Couplers are quick . . . they're safe . . . they're sure.

To connect, just push the adapter section into the check unit. Accidental uncoupling is impossible—it takes a positive manual twist of the check unit sleeve to disconnect the coupler and shut off the air.

Make compressed air accessible in your plant, as the largest and most modern plants have done. Schrader Couplers are available in many pipe thread sizes and hose adapters. And remember—Schrader produces a full line of cylinders, valves and other air control equipment, to make your compressed air circuits neat . . . efficient . . . reliable. For details, write today—or fill out the coupon below.

Schrader

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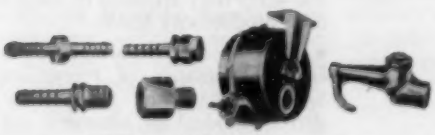
LEADERS IN AIR CONTROL SINCE 1844



The complete Schrader line of pneumatic accessories includes everything you need

A. Schrader's Son
Division of Scovill Manufacturing Company, Incorporated
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Name_____ Title_____

Company_____

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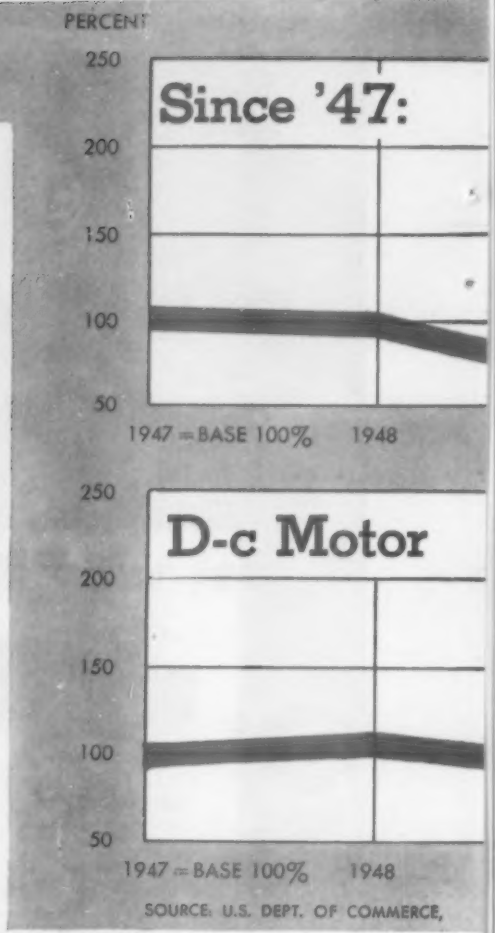
PROGRESS IN DIRECT CURRENT DRIVES

- U.S. industry is trending to automatic processes and machines . . .
- And statistics show a big upswing in d-c motor purchases.
- General Electric meets demand for high-output production equipment.



AUTOMATIC MACHINES like this boring mill use d-c drives for accurate speeds, faster output. Irregular, three dimensional shapes are machined automatically to close tolerances.

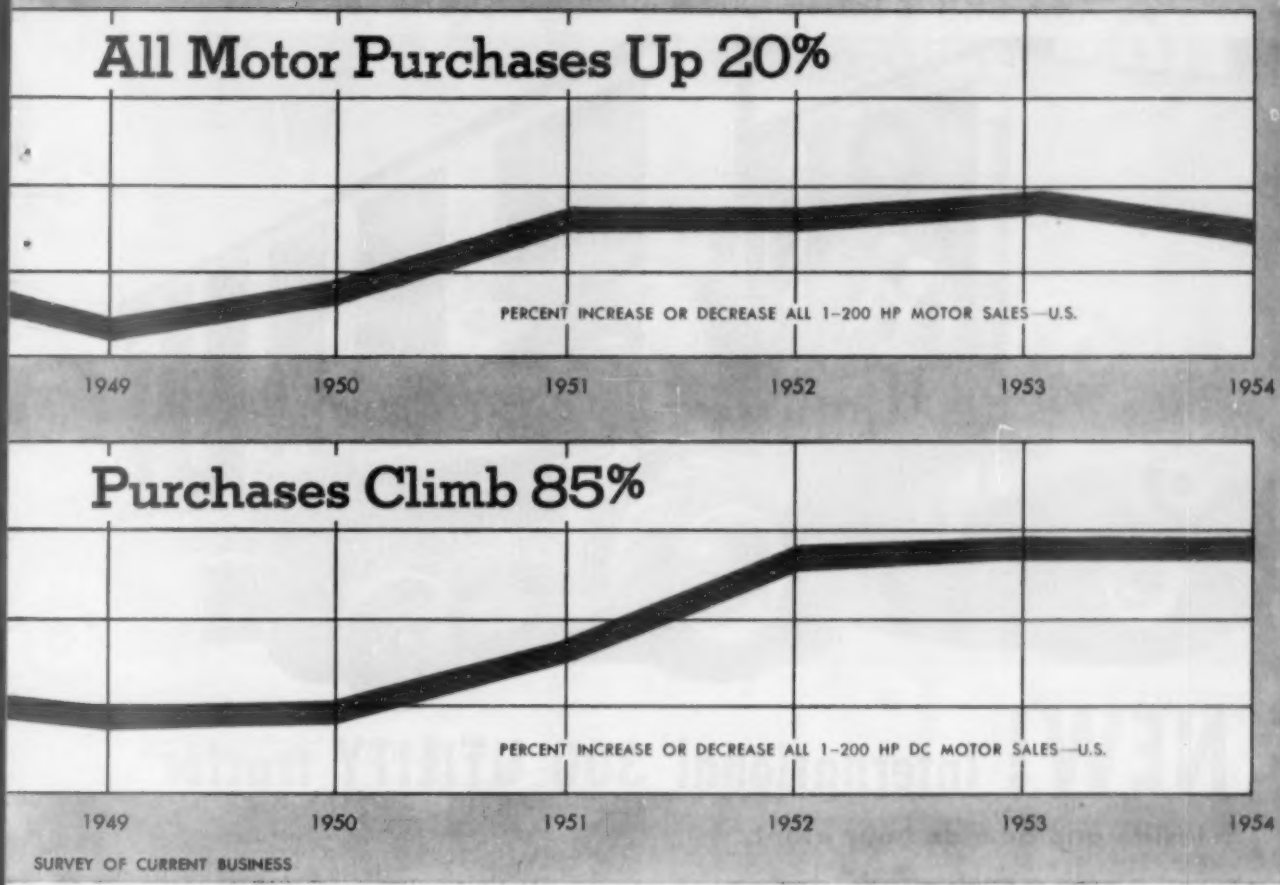
D-c Drives:

U.S. industry is moving steadily toward mechanization, automatic machines and processes—to produce more and better goods. As a result, new and unique methods of mass production are constantly being developed.

Statistics show this trend to more automatic means of production is increasing the demand for direct-current drives (graphs).

• **Reasons**—Industry has a tough job ahead. If it is to meet an increased demand for goods and services of at least 40% by 1964, with a predicted increase of less than 13% in work force, further mechanization and more continuous processing is necessary. D-c equipment provides the versatility and sensitivity required to meet future high productivity levels.

• **Why D-c for Automatic Processing?**—Thousands of recent applications dramatically show why d-c drives are ideal for automatic and continuous processes. For instance, in manufacturing rubber-coated tire fabric, the process begins with a multitude of cord spools unwinding at high speeds. After racing through several



The Answer to Automatic Production

different processes, each requiring varying rates of speed, the completed product is wound up on another set of spools. The entire operation, driven by adjustable speed d-c equipment, is automatic—from start to finish.

• **Adjustable Speed**—The drive for this production line must do two things: 1. Adjust operating speeds at various stages of the process for proper cord tension. 2. Adjust speeds to accommodate a variety of cord sizes and types. The ability to meet these demands—fast and accurately—explains the trend to direct-current motors. There is no device yet discovered that is a better, more universal source of precisely controlled adjustable speed.

• **D-c Power Readily Available**—Although few utilities supply d-c power directly, the many advantages of d-c drives should not be ruled out when considering expansion or modernization. With packaged conversion equipment—rectifiers or motor-generator sets—d-c power supply is readily available. For instance, G-E Speed Variators convert incoming a-c power to d-c in compact cabinets which install next to driven machinery or in any convenient load-center location.

• **Cost Factor**—Although the initial investment for this type of electrical equipment is usually higher than for constant-speed drives, the versatility of direct-current drives often increases machine output and quality of finished product to such an extent that over-all investment per unit of production goes down—not up.

• **Notable Examples**—D-c electronic printing-press drives add production flexibility to make practical speeds of up to 210,000 newspapers per hour. In the steel industry d-c driven cold-strip mills accelerate to full speed in 10 seconds and deliver steel strip at over 70 miles per hour. D-c log-carriage drives give the lumber industry high speed operation and fingertip control for increased board feet per hour production. D-c adjustable-voltage shovel drives enable modern shovels to move up to 60 cubic yards per bite. In the paper industry d-c sectional paper machine drives provide operating flexibility needed for high-speed, uninterrupted production of quality paper.

• **New Developments**—G-E engineers are working constantly on the development of new d-c drives to meet demands of U.S. industry for faster, more automatic, more continuous production.

• **Industry-wide Applications**—D-c drives are boosting output in industries throughout the country. Companies desiring higher production can obtain equipment selection and application help from engineering specialists in 149 conveniently located G-E Apparatus Sales Offices. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 818-1

GENERAL ELECTRIC

NEW! International® 300 UTILITY tractor

Inside and outside your plant,

It's a cost-cutter!

Here's a compact, powerful tractor that's equally at home on paved surfaces, or on soft ground in far corners of factory yards. Big pneumatic tires allow a fork-lift, for example, to be used on yard areas where solid tire outfits would hopelessly mire.

The powerful, all-tractor engine delivers a maximum of 39.5 horsepower at the drawbar—*up to 4,379 maximum pounds pull.* With IH Torque Amplifier drive there are 10 speeds forward, from 1.5 to 16.7 mph. Full hydraulic control for all equipment. Turning radius is 9 feet, 8 inches.

NEW International CUB LO-Boy

With 68½-inch wheel base, 48-inch overall width, and 55-inch height, the new International Cub LO-Boy pulls heavy loads through narrow factory aisles, works in low-ceiling bays. It's equally at home outside the plant . . . mowing lawns or clearing snow from drives and walks. ➔

Your nearby IH tractor Distributor or Dealer will gladly give you full information about the full line of International industrial wheel tractors, 9.4 to 47.4 maximum drawbar hp. Look in the classified directory . . . 'phone for a demonstration! Or, write International Harvester Co., Dept. FMM-11, Chicago 80, Ill. for illustrated specification folders.

Heavy-duty loader and 'dozer blade—only one of the many equipment combinations easily mounted on the International 300 Utility tractor.

SEE YOUR

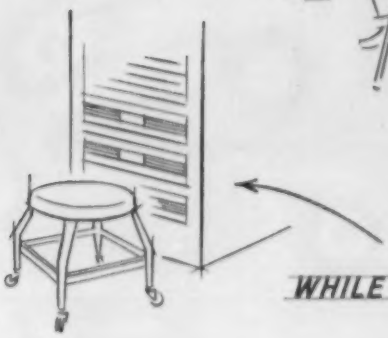
INTERNATIONAL HARVESTER DEALER

International Harvester products pay for themselves in use—McCormick Farm Equipment and Farmall Tractors . . . Motor Trucks . . . Crawler Tractors and Power Units—General Office, Chicago 1, Illinois.

USE STANDARD HALLOWELL STOOLS AND CHAIRS IN PLANT MODERNIZATION

MODEL 206 - ROUNDED SEAT WITH CLAMP-TYPE BACK

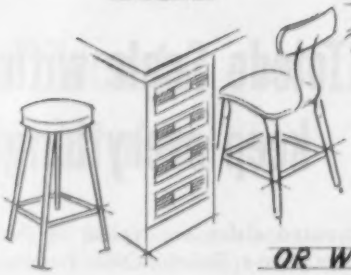
IN THE TOOLROOM



WHILE FILING

AT DRAFTING BOARDS

DESKS



OR WORK BENCHES

MODEL 230
ROUNDED SEAT
WITHOUT BACK
4" HEIGHT ADJUSTMENTS
IN 1" INCREMENTS

MODEL 250
SHAPED PLYWOOD SEAT
POSTURE BACK

VARIOUS HEIGHTS, FIXED AND ADJUSTABLE
SEVERAL SEAT MATERIALS -- ALL STANDARD

Standard Units · Standard Accessories · Welded Steel Construction · Stocked by Leading Shop Equipment Dealers · Send for "Stoolcraft" – a Humorous Booklet on Where You Can Use Hallowell Stools and Chairs. Hallowell Shop Equipment Division, Standard Pressed Steel Co., Jenkintown 11, Pa.

HALLOWELL SHOP EQUIPMENT DIVISION
STANDARD PRESSED STEEL CO.
SPS
JENKINTOWN PENNSYLVANIA

BENCHES (CABINET, WORK, UNIT) • STOOLS AND CHAIRS • SHOP DESKS • TOOL STANDS AND CABINETS • DRAWERS, DRAWER TIERS • STEEL CARTS • SHELVING

REPUBLIC BOXES and simplify parts handling

Republic Boxes and Skids are used on the production line at Toledo Scale. Parts are moved from one machining operation to another quickly and easily by lift truck or hand-operated units.

Finished parts are stored in neat areas like this. Boxes are labeled with part numbers. Box and skid design permits easy visual inspection for inventory checks. Fits in nicely with other-type units.

...provide Toledo Scale with keep everything

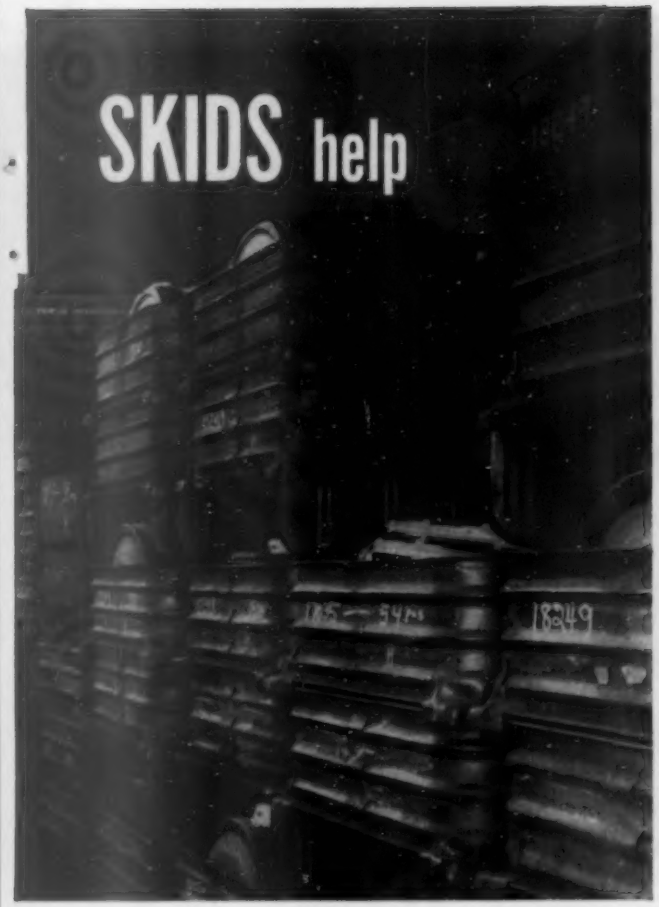
Neat, wide, uncluttered aisles are typical of the Toledo Scale Company plant at Toledo, Ohio. Republic Steel Box and Skid Units are used at practically every stage of production, from receiving to shipping.

For example, keeping track of and handling the thousands of parts needed for the products manufactured by Toledo Scale could be a difficult job. But, the company does it efficiently and at low cost with the help of Republic PB-130 Box and Skid Units.

These units are specifically designed for stacking. Box capacity can be varied by adding or removing ring sections. Stacking brackets are welded to the bottom corners of each box. Tiering lugs are welded

REPUBLIC

World's Widest Range of Standard



a place for everything— in its place

to some boxes so that, when they are used as the top section, additional complete units can be tiered.

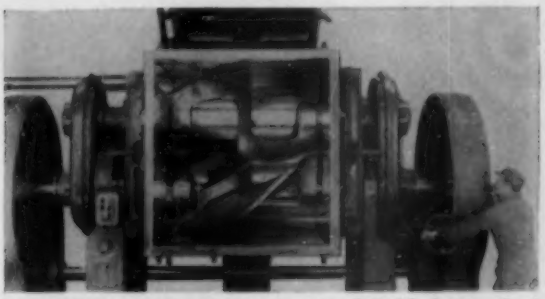
The skids are equipped with bumper-type channel runners. These are arc welded to the skid legs adding strength to the sides and protecting skid ends and floor surfaces.

The PB-130 is only one of many types of box and skid units manufactured by Republic's Pressed Steel Division. There is a wide range of sizes from which to choose. Or if you have a special handling problem, Republic engineers are available to help you design a unit to meet your individual requirements. The coupon will bring you more facts by return mail.

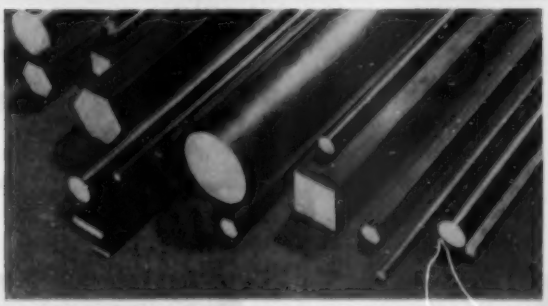
STEEL

Steels and Steel Products

REPUBLIC STEEL PIPE has been serving industry for over 40 years. And today it's better than ever. The improved Continuous Butt Weld Process offers many advantages. Pipe has uniform strength and ductility, tight adherence of the galvanized coating, is easily threaded, readily bent, Your Republic Pipe Distributor has a full line of this high-quality pipe in sizes you want.



FREEDOM FROM RUST AND CORROSION makes ENDURO Stainless Steel equipment your best buy. Equipment made from ENDURO, like this high-pressure vacuum mixer, stays on the job, requires minimum maintenance, lasts long. It's easy to keep clean and attractive. Republic will help you and your equipment suppliers apply ENDURO's qualities and benefits efficiently and economically.



ARE YOUR AUTOMATICS TURNING OUT ALL THEY COULD? Republic Cold Finished Steels will give you consistently high MACHINABILITY—pin top ratings on feeds and speeds, longer tool life, freedom from abrasion, improved surface finish and high product quality. Republic produces high-quality cold finished bars in all standard and special carbon, alloy and stainless analyses.

REPUBLIC STEEL CORPORATION
3140 East 45th Street
Cleveland 27, Ohio

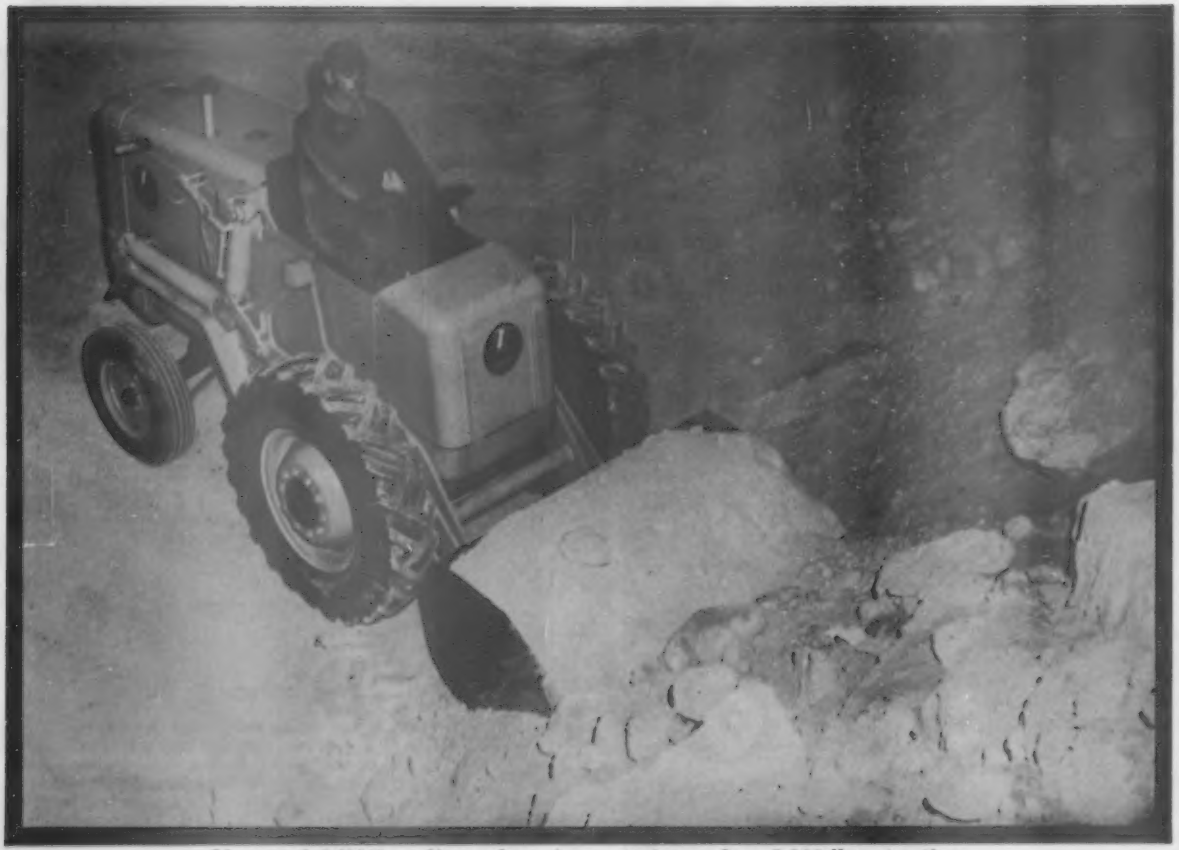
☐ Please have a Materials Handling Engineer call.
Please send more information on:
☐ Materials Handling Equipment ☐ Steel Pipe
☐ Cold Finished Steels ☐ ENDURO Stainless Steel

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____



New **model HAH** — digs and carries up to 1 cu. yd. or 3,000 lbs. at a time.

BOTH NEW and

DIGGING POWER

3,000 lbs. and 4,500 lbs. of tractive thrust, plus powerful upward rotation of bucket by twin hydraulic rams, develop tremendous digging power.

40° BUCKET TIP-BACK

Bucket tips back 40° on its hinges before it is even lifted — to get heaped bucket-loads quickly and prevent loss due to spillage.

CARRYING CAPACITY

40° tip-back also brings loaded bucket back close to machine *and low* for safe, fast transport.

SAFETY-STABILITY

Bucket arms and other moving parts are mounted and positioned low where they are no hazard to operator's limbs.

New **model HA** — digs and carries up to 18 cu. ft. or 2,000 lbs. at a time.

More Productive

Hough, the pioneer and leader in the tractor-shovel industry, is pleased to present these all-new "PAYLOADER" units. Both have front-wheel-drive and rear-wheel-steer — especially designed for stockpile work and fast material moving in close quarters. They give you a choice of sizes to best fit your requirements — they're the finest of their type in Hough history — they're both way ahead of the field in design, performance and all-round value.

Your Hough Distributor is eager to show what these new machines can do for you. The Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Ill.

OTHER FEATURES of these outstanding new models include: torque converter drive; full-reversing transmissions; closed, pressure-controlled hydraulic system; large hydraulic brakes; accumulator in hydraulic system that prevents pressure shocks and facilitates bucket control.

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO.
755 Sunnyside Ave., Libertyville, Ill.

Send data on "PAYLOADER" units
Model HA☐ Model HAH☐ larger sizes☐

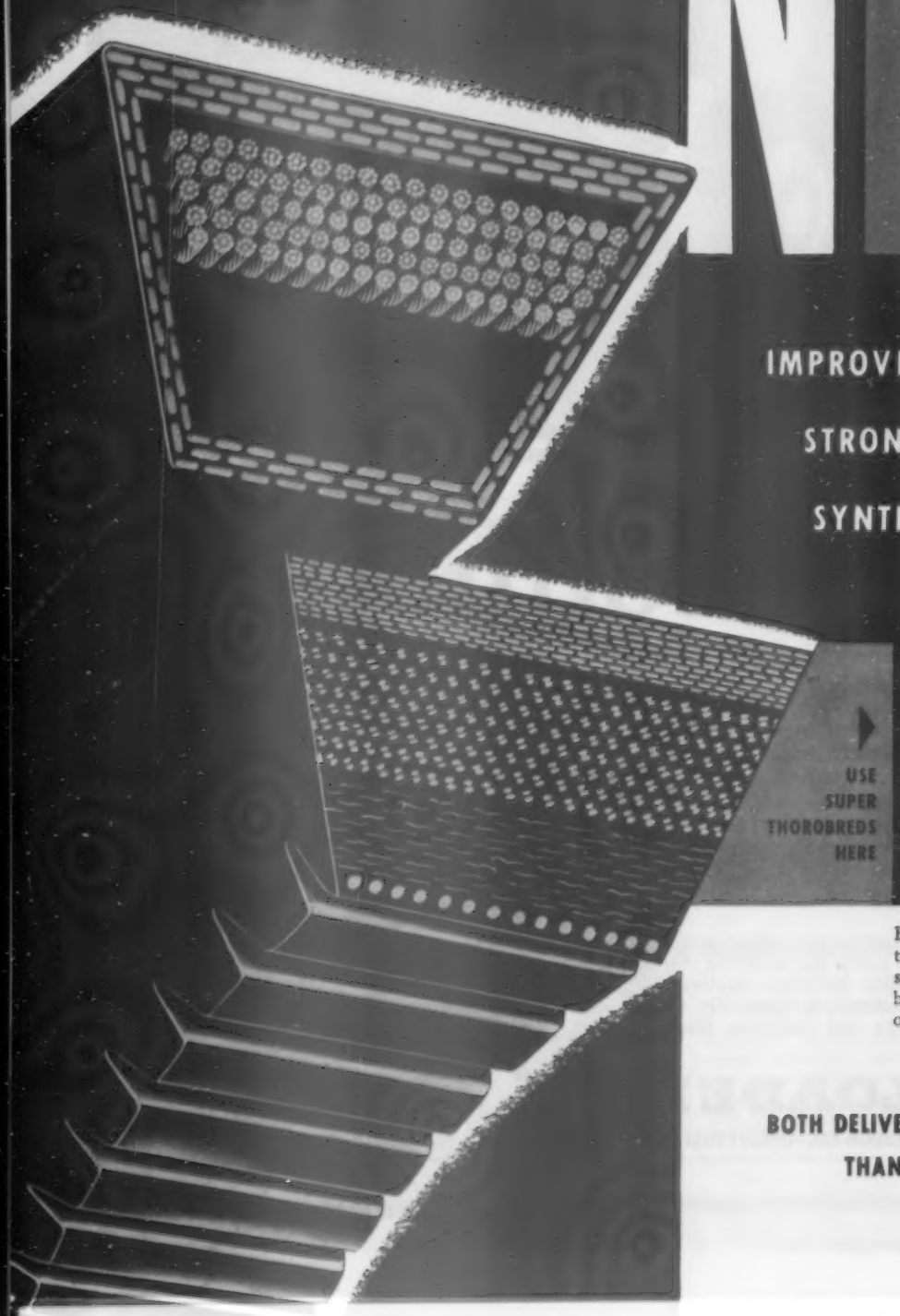
Name.....
Title.....
Firm.....
Street.....
City.....State.....

NEW

IMPROVED COMPOUNDS

STRONGER FABRICS

SYNTHETIC CORDS



Because Super Thorobreds have controlled elasticity without excessive stretch they reduce belt wear, increase belt life where inherent misalignment or extreme belt twist conditions exist.

BOTH DELIVER 40% MORE HORSEPOWER THAN STANDARD V-BELTS

POWERFUL Dayton V-Belts

THAT PROVIDE GREATER POWER CAPACITY AND LONGER BELT LIFE FOR YOUR TOUGHEST POWER TRANSMISSION DRIVES

Super Thorobred . . . an all new Dayton V-Belt. Specifically built for rugged drive requirements . . . where frequent peak or shock loads are encountered . . . where inherent misalignment conditions exist or where oil, heat or static is a drive problem. Because they are built with controlled elasticity without excessive stretch, Super Thorobreds act like a shock absorber . . . reduce belt whipping . . . cushion shock loads. New, stronger, more flexible cover has longer wearing qualities, resists abrasion and cracking. Super strength, synthetic cords provide 40% more H.P. than standard V-Belts. Oil proof, heat resistant, static dissipating Super Thorobreds are available in a complete range of standard sizes. Try Super Thorobreds on your toughest drive. You'll find they're built rugged, dependable and long lasting.

The new improved design Dayton Cog-Belt. The V-Belt that's built to bend. Exclusive Cog construction provides greatest possible flexibility. That means smaller sheave diameters, shorter center distance, less space. And with its 40% bonus horsepower capacity, you can use narrower sheaves . . . fewer grooves . . . fewer belts. Substantial savings in drive weight and cost can be made. And raw edge construction gives maximum coefficient of friction in the sheave grooves. The belt grips tighter, delivers smooth, positive power. Slippage is virtually eliminated, strain on bearings is reduced, fewer take-ups required. Your nearest Dayton distributor will be glad to give you all the facts on the New Super Thorobred V-Belt and improved Cog-Belt. Or write direct to Dayton Rubber Co., Industrial Division, Dayton 1, Ohio.

Belt breakage caused by vibration, pulsation or impulse loads is virtually eliminated with Super Thorobreds due to their ability to check and absorb extreme shock.

Because of their 40% H.P. capacity, Cog-Belts permit drives with narrower sheaves . . . fewer grooves . . . fewer belts. Save 47.2% in drive area . . . 28% of drive weight.

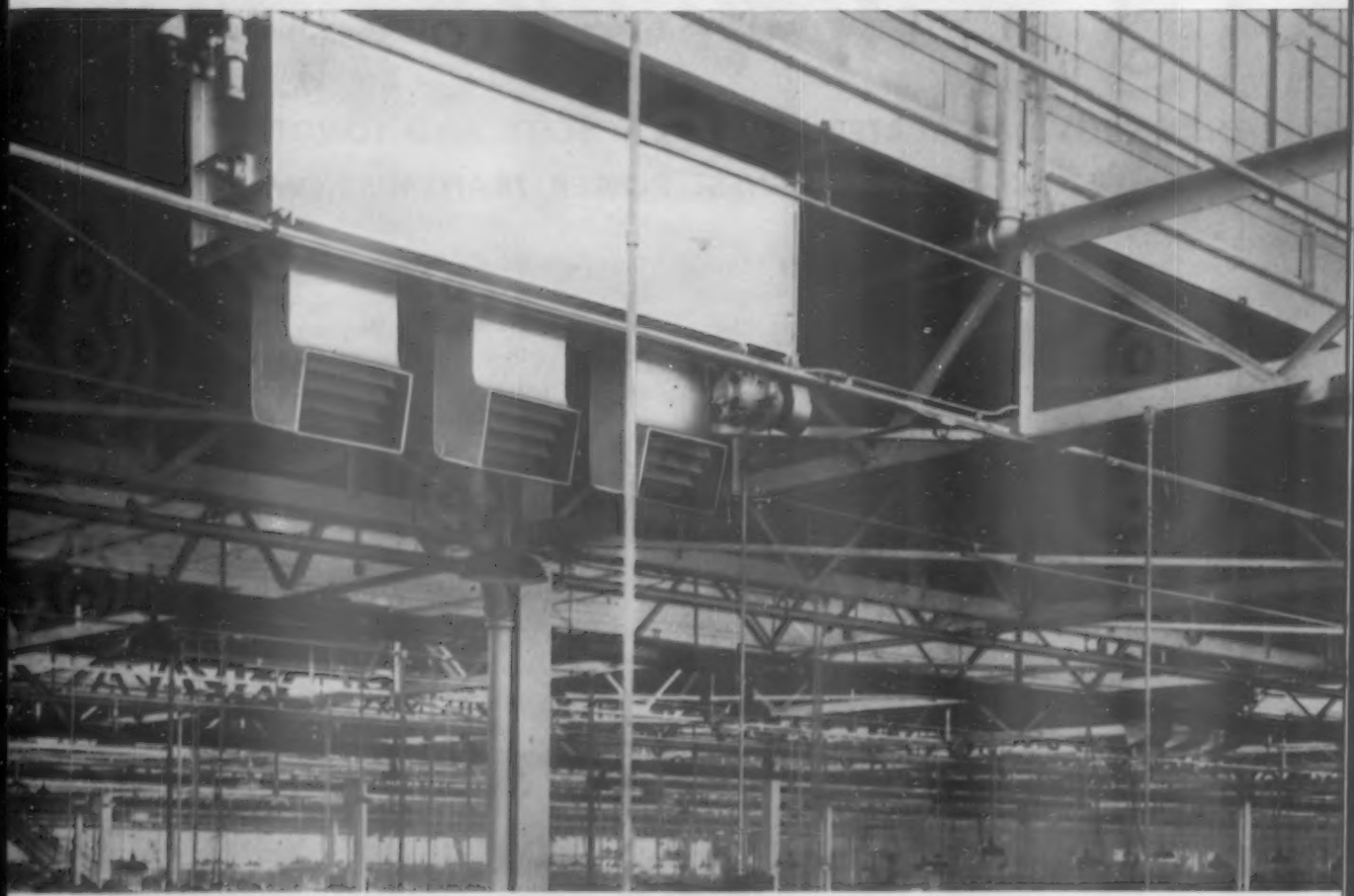
Since Cog-Belts bend easier, smaller sheaves with shorter center distances are permissible. You can actually save 30.6% of the space needed for center distances.

GOLDEN JUBILEE
Dayton Rubber
50 YEARS OF PROGRESS

WORLD'S LARGEST MANUFACTURER
OF V-BELTS

Here's why Trane Unit Heaters are in such demand:

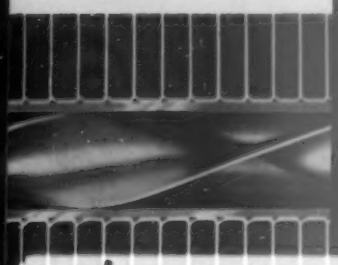
One unit can solve plant air cleaning or



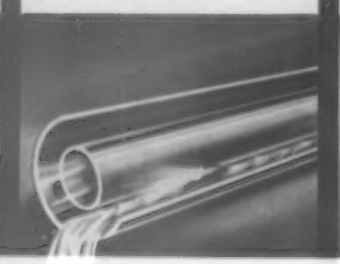
What the Torridor will do: The Torridor can be used to heat large areas where air must be spread over great distances, is equally suitable for heating numerous small rooms or a central system with ducts. It can be used as a combined heating and ventilating unit . . . for blanketing doorways with heat . . . for special process applications such as fog removal, ice melting, drying, curing, etc.

Typical users include: PRATT AND WHITNEY AIRCRAFT; WESTERN ELECTRIC CO.; CARBIDE AND CARBON CHEMICALS CO.; CATERPILLAR TRACTOR CO.; DEERE AND CO.; JOHNS-MANVILLE CORP.; KIMBERLY-CLARK CORP.; CORNING GLASS WORKS; INTERNATIONAL BUSINESS MACHINES CORP.

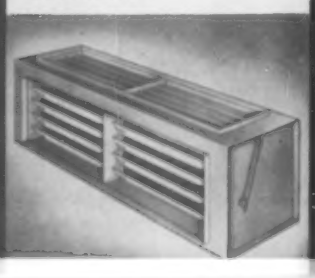
Turbulator in hot water coils assures maximum heat transfer from hot water to surface of coil tubes.

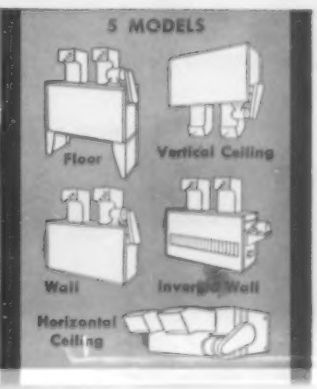


Kinetic orifice in steam coils releases steam in direction of condensate flow, speeds condensate drainage. Reduces possibility of freeze-up.



Mixing box blends re-circulated with outside air in any combination. Dampers may be operated manually or motorized. A standard accessory.





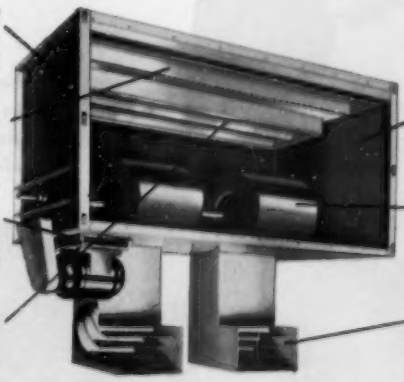
heating, ventilating, process-drying needs

Use this Trane Torridor with or without ducts...in large areas or small...for comfort or process heating and ventilating needs.

One unit does the work of many! A single TRANE Torridor unit can produce as much heat as several propeller-type heaters—plus ventilation. Pipe, valve and fitting needs are less . . . installation and maintenance costs are lower. Capacities up to 1½ *million* Btu's.

Locate Torridors anywhere! Units can be hung from walls or girders, mounted on ceilings, or set on the floor. A wide choice of nozzle arrangements, top or bottom discharge lets you direct warmth in any desired direction.

For hundreds of applications. Heating, ventilating, air cleaning, process heating or drying . . . the amazingly versatile, high-capacity TRANE Torridor solves many of these problems. For complete information contact your engineer or nearest TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.



Rugged casing of bonderized steel. Extra strong, rigid, *welded* construction.

Coil choice of high or low pressure steam, hot water, standard or "non-freeze" SD type.

Hinged motor mounting block for quick, easy adjustment of belt tension.

Damper choice in ventilating models. Face-and-by-pass (shown) or Thermadjust.

Filter choice of permanent or throwaway types, in flat or V-type frames.

Removable panel provides easy access to heart of unit. (Shown removed.)

Quiet fans dynamically and statically balanced on electronic equipment.

Directional vanes in the nozzles straighten air stream, eliminate turbulence.

one source · one responsibility

TRANE

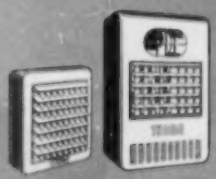
Industrial Heating

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa. • Trane Co. of Canada, Ltd., Toronto • 90 U. S. and 15 Canadian Offices

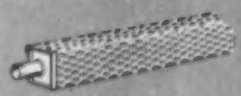
Quality products for all your heating and ventilating needs

PROJECTION HEATER



HORIZONTAL HEATERS
Model H—Gas-Fired

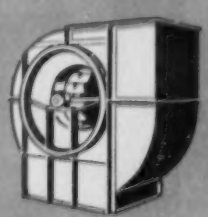
WALL FIN ELEMENT



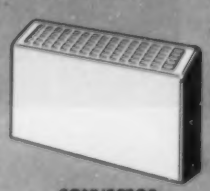
WALL FIN WITH GRILLE

STEAM SPECIALTIES

ROOF VENTILATOR



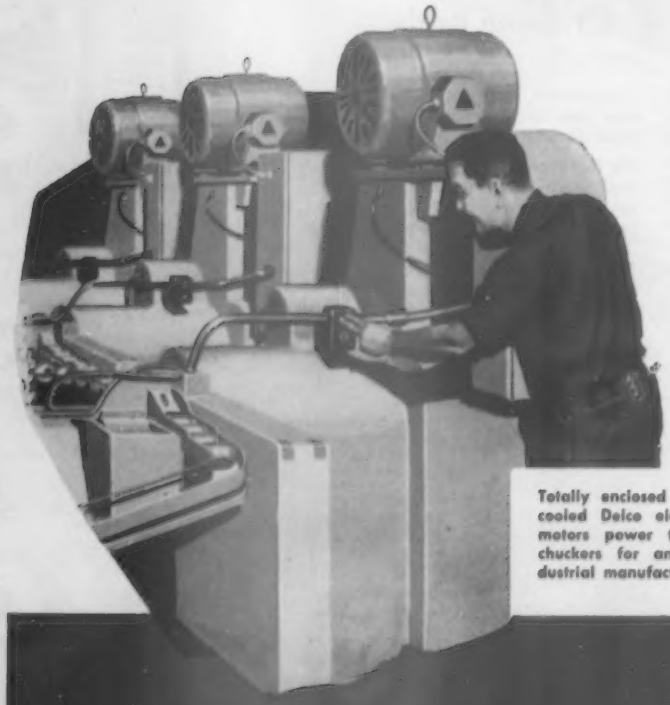
CENTRIFUGAL FAN



CONVECTOR

For top performance,

DELCO



Totally enclosed fan-cooled Delco electric motors power these chuckers for an industrial manufacturer.

An electric motor proves itself by performance. And performance proves that Delco electric motors work harder, last longer, cost less to maintain.

Every Delco motor—from fractionals through the largest integrals—is built to exacting standards of workmanship . . . backed by almost half a century

★ *See Delco national advertising in The Saturday Evening Post for the story of the full Delco electric motor line.*

industry has found that it's

preferred

of skilled design and engineering experience. Our design engineering service job-fits the proper electric motor to every specific industrial need—helps to specify the right motor for every operation. Delco Products engineers will work with your engineers to give you complete satisfaction. And you can be sure that Delco delivery, too, will be exceptionally good. All the more reason why *you should standardize on Delco electric motors.*

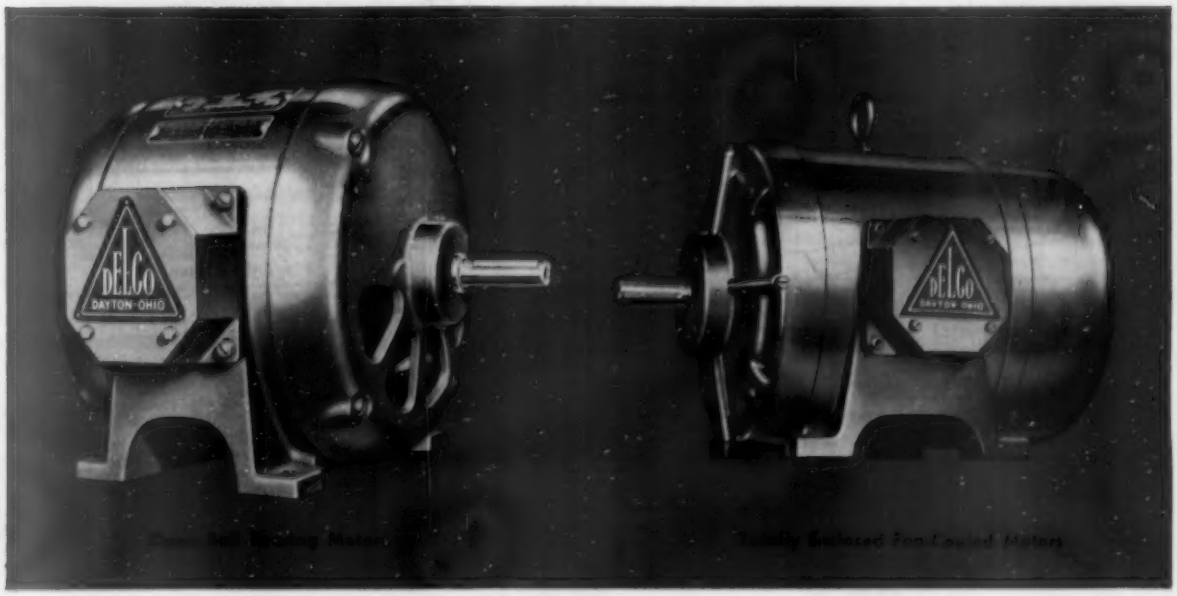
DELCO DAYTON OHIO

GM GENERAL MOTORS DELCO

DELCO *Electric* MOTORS

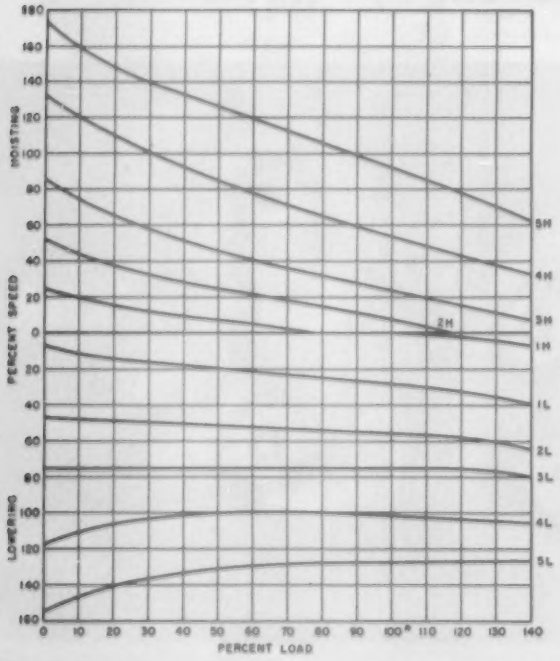
DELCO PRODUCTS, DIVISION OF GENERAL MOTORS, DAYTON, OHIO

Proved best by Performance!

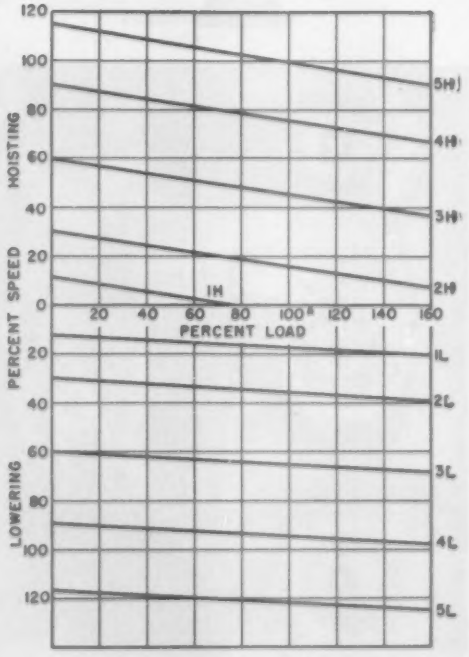


PINPOINT ACCURACY of hoist equipped with G-E Speed Variator drive helps cut cost, speed scrap handling at Northwest Steel Rolling Mills, Inc. Only routine maintenance has been required on the drive in 1½ years of rugged, tough service. Compact construction of packaged power unit, visible above cab, saves space in limited bridge area.

Easily-installed G-E hoist drive



FAST EMPTY-HOOK SPEEDS to help boost yard output can be obtained by using a compound wound hoist motor with the basic G-E Speed Variator.



RELATIVELY FLAT LOWERING CURVES through use of shunt wound motor make G-E Speed Variator ideal for jobs requiring accurate positioning for wide range loads.

*100% load corresponds to rated motor current hoisting.

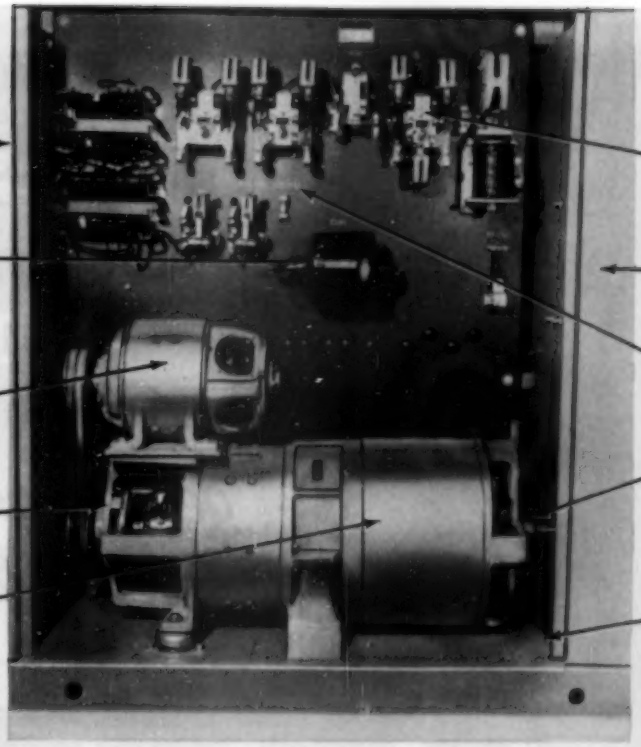
1. **Compact,** "packaged" power unit permits versatile mounting on crane equipment, requires fewer conductor leads.

2. **Smooth,** fast response to operator's control is provided by damping motor which prevents shock to cables and gears.

3. **Double belted,** oversized exciter provides ample excitation power for generator field, drive motor field, d-c control, and magnetic brake.

4. **Large openings** in end shield permit easy inspection of brushes and commutator.

5. **Powerful,** dependable motor generator set meets rugged duty cycle of crane and hoist equipment.



6. **Designed** for easy maintenance, most components are mounted on front of panel.

7. **All a-c components** protected in separate end compartment.

8. **All devices** identified for quick recognition, easy servicing.

9. **Pressurizing fan** and air filter system help keep unit free from dirt and dust. Filters easily replaced.

10. **For easy access,** pull-out pins on cabinet door hinges allow door removal without full swing out. Lift-off type doors are also available.

10 ADVANTAGES BUILT INTO THE G-E SPEED VARIATOR POWER UNIT FOR HOIST DRIVE APPLICATION

gives high-speed crane operation

Speed Variator drive offers faster, smoother performance, reduced maintenance

General Electric's Speed Variator hoist drive has been designed with the performance characteristics needed to provide fast, efficient movement of materials in your operation.

CONSTANT LOAD SPEEDS, relatively unaffected by load weight, enable the crane operator to pinpoint even the heaviest loads. By offering quick, smooth response, and fast empty-hook speed, the G-E hoist drive assures safer, faster, smoother crane operation.

FOR EASY, VERSATILE INSTALLATION, the Speed Variator unit is completely engineered, wired and tested at the G-E factory. When compact power system is mounted on crane bridge, there are no large resistor banks to install, fewer collector leads are required, and installation time and expense are greatly reduced. In addition, the Speed Variator unit requires minimum space in limited bridge area.

ONLY ROUTINE MAINTENANCE CHECKS have been required in 1½ years service on G-E hoist drive installed at Northwest Steel Rolling Mills, Inc., Seattle, Washington (photo above, left). Smooth acceleration and deceleration of drive eliminate load shock and prolong life of cables and gears. Long brake life is also assured because load speed is decreased electrically before brake sets. Pressurized Speed Variator cabinet has large front and rear doors for easy inspection, and air filters protect power unit from dust and dirt. The many advantages of the G-E hoist drive add up to efficient, low-cost materials handling.

FOR MORE INFORMATION, contact your nearest General Electric Apparatus Sales Office. A specialist will give you the complete story on the G-E hoist drive—the drive that is factory tested, co-ordinated, and adjusted for optimum crane performance. 815-9

DIRECT CURRENT MOTOR AND GENERATOR DEPARTMENT, GENERAL ELECTRIC COMPANY, ERIE, PENNSYLVANIA.

GENERAL ELECTRIC

Wagner®
TRANSFORMERS
...the choice of leaders in industry

for shorter runs of copper... reduced line losses... lower installation expenses...

get the right voltage close to the load

with a

Wagner Dry-Type Transformer

Wagner Dry-Type Transformers give dependable power distribution right at the load... close to your portable tools, machines or lighting system. This means a big savings to you in terms of shorter runs of copper, reduced line losses and lower installation expenses. Not only that, Wagner Dry-Type Transformers are compact, light in weight and safe to use—even in the presence of fire hazards.

The new 150° rise, totally-enclosed dry-type transformer with silicone insulation, is designed especially for use where ventilated transformers are impractical. When you install these transformers, fireproof vaults and other protective enclosures are unnecessary. Core and coil is protected from lint, moisture, dust and other contaminating materials by totally-enclosed sheet steel cases... and this kind of protection reduces maintenance to almost nothing. They can be installed outdoors, because their construction is completely weatherproof.

The 150° rise transformer is standard in ratings 3 through 10 kva and is also available through 50 kva. The 55° rise model is standard in 1, 1½ and 2 kva and the 80° rise transformer is standard in ratings 15 through 100 kva.

Wagner®
Form W

Core and Coil permits compact, lightweight transformers...

The heart of each Wagner Dry-Type Transformer is the famous Wagner Form W Core and Coil assembly. Core is of cold-rolled oriented grain transformer steel. The Form W design permits less weight per kva and small size cases for space saving installation.

Wagner Electric Corporation
6412 Plymouth Ave., St. Louis 14, Mo., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

T89-41

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

ALUMINUM PAINT PROTECTS...

...against rust, smoke and fume corrosion, evaporation of volatiles, and heat expansion

Good aluminum paint actually puts a protective *shield* on rustable metal and masonry.

In industry this means added protection against corrosive smoke and fumes, against rust, against concrete spalling. And because aluminum paint reflects up to 85% of light and heat rays, it reduces evaporation of volatiles, guards against heat expansion and brightens everything inside and out.

Use it everywhere—from rig to retail. A single coat usually covers and lasts for years. Watch it cut maintenance and replacement costs.

Reynolds Metals Company does not make aluminum paint. But if you would like the names of manufacturers who rely on the high quality of genuine Reynolds Aluminum Pigments, we'll gladly send you the list. Just use the coupon below.

ALUMINUM ROOF PROTECTION, TOO with a Warranty of Quality!

Asphalt-Aluminum Roof Coatings and Paints add years to roof life, keep interiors cooler in hot weather. Insist on aluminum roof coatings bearing this warranty. It assures you of an approved vehicle and at least two full pounds of highest quality aluminum metal pigment in every gallon.

The BEST Aluminum Paints and Coatings are made with pigment of

REYNOLDS ALUMINUM

Reynolds Metals Company
P. O. Box 1800-PJ, Louisville 1, Kentucky

Please send me information about Aluminum Paints and Roof Coatings.

☐ Also send list of manufacturers.

Name_____

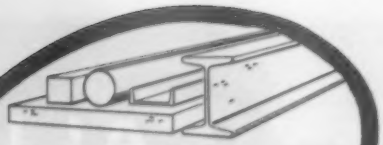
Company_____

Address_____

City_____ Zone____ State_____

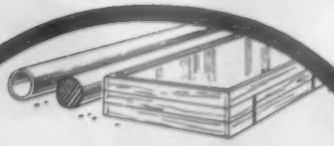
This advertisement appears in the interest of the Paint Industry of America

call Ryerson for steel



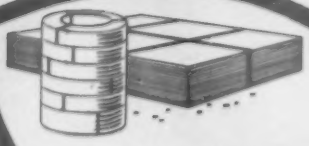
CARBON STEELS

Hot rolled and cold finished bars; channels, angles, beams, etc.; plates of every kind.



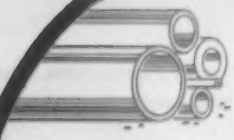
STAINLESS STEELS

World's largest stock of sheets, plates, bars, pipe, tubing, fittings, etc.



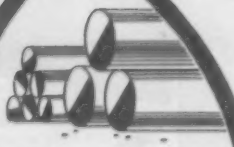
SHEET AND STRIP

Over 20 kinds and many gauges—in pattern sizes or cut to your order.



TUBING

Mechanical and pump cylinder tubing, seamless and welded; hydraulic fluid line and boiler tubes; structural tubing, etc.



ALLOY STEELS

Tested alloys of known hardenability, standard and aircraft quality, as rolled, annealed, heat treated.

Quick delivery from nation's largest stocks

Need steel in a hurry? Ryerson stocks are the nation's largest, so one call to your nearby Ryerson plant brings quick delivery of almost any kind of steel in almost any quantity—all of it certified for high uniform quality.

Do you want your steel prepared for immediate use? Ryerson facilities include the most modern close-tolerance equipment for sawing, shearing and flame cutting to your specifications.

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Looking Ahead in Business

The business boom will carry over into 1956—but at a less dizzy pace of advance than in 1955.

If inventories of unsold goods start to pile up, they could call a halt to the boom. But, although stocks have been building up at an annual rate of between $3- to $3.5-billion in recent months, they are not yet out of line with retail sales.

Take stocks of automobiles, for example. Unsold cars in dealers' hands number about 450,000—less than one month's supply (lowest inventory since December 1953). So there won't be many 1955 models left when 1956 cars appear in showrooms.

The record amount of installment credit extended, has pushed consumer spending to its all-time peak of $256.5-billion at an annual rate in the third quarter. Total installment credit is now over $26-billion, about half of it for new cars. But the rate at which consumers will continue to add to their debt may decline next year. If it does, it could put a squeeze on retail sales.

•

There are no signs yet that total retail sales WILL drop off next year. They may actually continue to rise, for two reasons:

First, the new round of wage boosts has not ended. A number of automatic increases go into effect next spring. The steel workers' contract is also open for negotiation, and will probably mean higher wages. Bulging paypackets in coming months are sure to bolster total personal income and thus spending in the year to come.

Second, tax cuts appear a near-certainty in a wide-open election year, such as 1956. Tax cuts on personal incomes, combined with a boost in wages, make it an almost sure bet that retail sales will stay 'way up—or rise even higher—next year.

•

To meet a continued boom in retail sales, plants are planning high production rates for first half of 1956. Production will probably fluctuate between 142 and 147 on the FRB index. (In September the index stood at 143.) Here is how it looks for several key industries:

Car production in 1956 is now estimated at between 6- and 6.5-million passenger cars; 1955 output will top 7.5-million by Dec. 31. The most optimistic estimate of 1955 production made at this time a year ago was only 5.8-million.

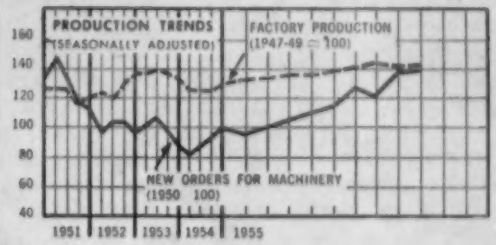
The steel industry is still producing at over 95% of capacity. With some types of steel remaining in short supply, you can expect this rate to continue for several months in 1956.

Appliance makers also see bright prospects for first half of 1956. It's expected that a good Christmas season will about wipe out 1955 inventories of many appliances by Jan. 1. So output of new 1956 models will be high again next year.

The record pace of home building has meant boom conditions for producers of building materials also. Now the squeeze on new mortgage financing being exerted by various Federal agencies will probably hold the number of new houses started in 1956 under the record 1.3-million level of 1955.

But there is still a backlog of other types of construction besides new residential houses. So producers of building materials—cement, lumber, glass—are sure to have another good year.

FACTORY'S FIGURES OF THE MONTH



Indicator	Sept.[p] 1955	Aug.[r] 1955	Sept. 1954
New Orders for Machinery (exc. elec.)[1]	139	137	94
Factory Production[2]	143	142	126
Consumers' Prices (cost of living)[3]	n.a.	114.5	114.7
Industrial Prices (materials, supplies)[3]	118.4	117.5	114.4
Manufacturing Employment (millions)[3]	16.9	16.8	16.0
Total Employment (millions)[4]	64.7	65.5	62.1
Unemployment (millions)[4]	2.1	2.2	3.1

[p] = premilinary [r] = revised

Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. U.S. Federal Reserve Board (1947-49 = 100); 3. U.S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 4. U.S. Dept. of Commerce, Bureau of the Census.

Looking Ahead in Labor

Automation will be a byword at the bargaining table in future negotiations. Labor unions are already gearing contract demands to take in effects of this "new industrial development."

Labor leaders say they are not opposed to automation. They know it's an inevitable trend that cannot be halted. But in some cases they will seek to slow down the process, or to take advantage of it in contract improvement for their members.

There's little agreement on what the final score will be. The pessimists anticipate severe unemployment and cite cases of hundreds of workers displaced by one machine. But many experts foresee a spate of new products that will create such a demand for goods that the result will be a labor shortage.

But, whatever the long-term outcome, the unions already have bargaining goals designed to minimize the immediate effect on their members. Those now in evidence:

• The auto industry's guaranteed wage plan is, in part, an attempt by Walter Reuther's CIO Auto Workers to prevent the sudden introduction of new automatic equipment that would mean large layoffs. Reuther's bargaining point was that any company forced to pay laid-off workers would be more than a little hesitant about revamping an industrial process if it was too costly.

• Unions of office employees, where new automatic equipment has cut into the number of office workers, are demanding a new type of seniority clause. It's a reverse, or bump-back, clause, that will guarantee that a displaced high-seniority worker can replace a worker on a lower job.

•

These two demands are initial symptoms of a new bargaining pattern that will increase in scope as more and more plants automate. Next year, and the years beyond, will find labor leaders making these new demands:

• A shorter workweek as part of a share-the-work program to keep all potentially displaced workers on the payroll and open up new jobs for the continually expanding labor force. CIO's Reuther predicts, for instance, a 30-hour week by 1956 as a consequence of automation.

• Earlier retirement for employees to make way for new workers, and—as an added effect—to permit older workers to enjoy the fruits of expanded production in the leisure of retirement.

• Retraining of workers to meet the skill requirements of the new machinery. Here the unions will demand that the employer bear the costs of the retraining programs.

The campaign to take advantage of automation will not be limited to the bargaining table. The unions will push new legislation in Congress to supplement their negotiation efforts.

One goal will be a demand for a cut in the Fair Labor Standard Act's 40-hour week. Another will be pressure to boost the new $1 minimum wage to $1.25 an hour—with the argument that the higher wage will be needed to buy goods produced by automation.

•

The Supreme Court—and not the National Labor Relations Board—will be the focal point for the next important federal rules on labor-management behavior. NLRB has no important policy decisions pending, but some of those already decided by the Board are now on trial at the high court. Before the current session winds up next October, the Supreme Court is expected to settle these important questions:

Can an employer insist on a strike vote among his employees? NLRB has said "No," that this invades the rights of a union certified as bargaining agent. But, in employer challenges to this ruling, there have been two decisions in U. S. Appeals Courts. One backed the Board, the other the employer.

Does an employer have to furnish wage data, manufacturing costs, and other important operating information to a union in collective bargaining? NLRB has held that an employer must turn over such information if he claims inability to grant a wage increase. But an appeals court rejected this ruling with the argument that this was confidential information that might hurt the employer if it got into the hands of a competitor.

Can a union official invade an employer's property for organizing or other purposes? The particular issue is whether a company parking lot is fair territory for union operations.

SEE LABOR RELATIONS NEWS, PAGE 246

Biggest Valve News in 50 Years!

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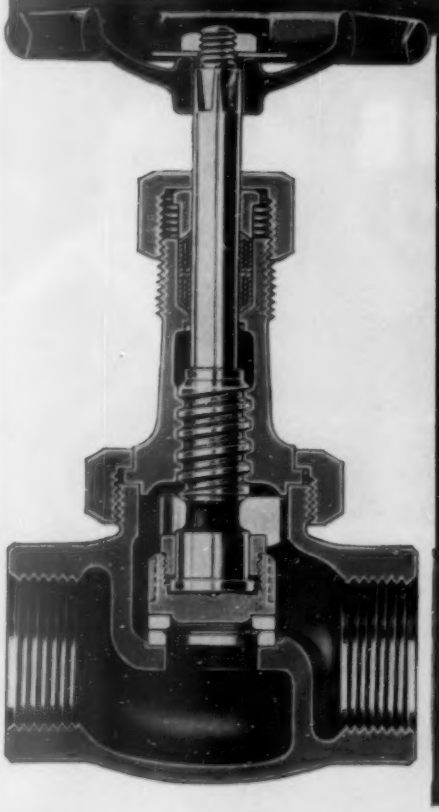
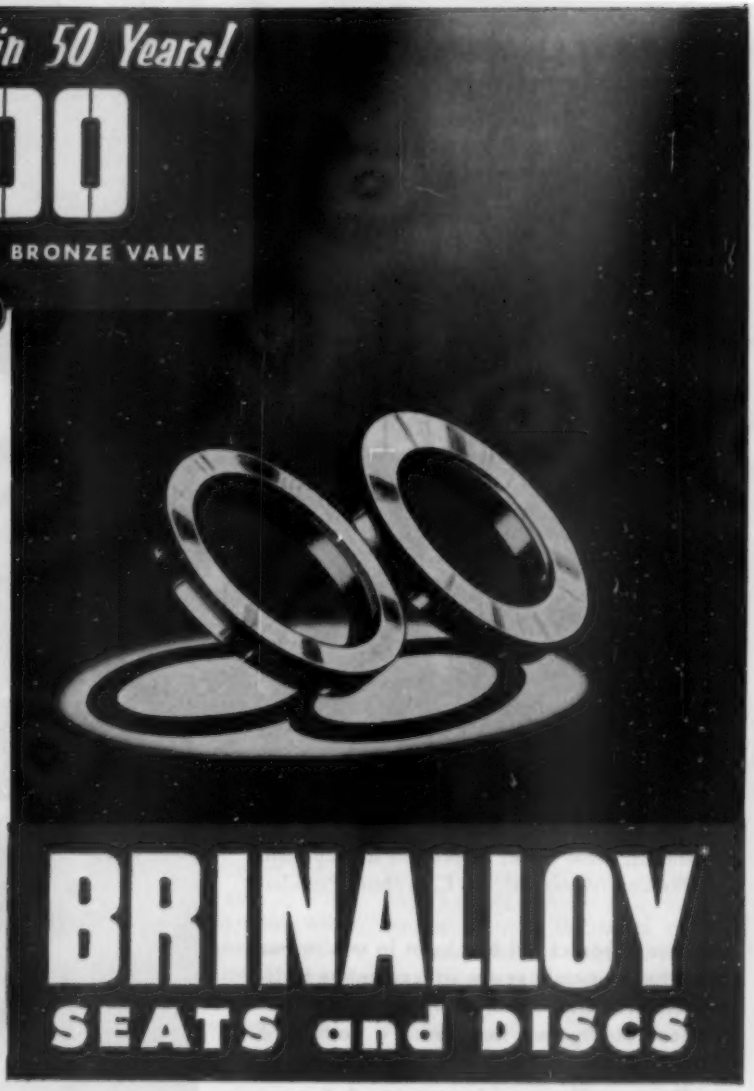
THE REVOLUTIONARY NEW BRONZE VALVE





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NOW you can beat the high cost of valve maintenance and replacement with the first completely revolutionary bronze valve in 50 years! No matter how severe the throttling service, in 4-year tests, there was no leakage, erosion, or wire drawing. This new valve pays cash dividends in maintenance savings — *year after year after year!* For more information, call your Lunkenheimer Distributor or write The Lunkenheimer Company, Box 360, Cincinnati 14, Ohio.

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COMMERCIAL SCREW MACHINE PRODUCTS, Inc., Horseheads, New York, reports on its experience with *Texaco Cleartex Oil*. Mr. C. L. Shull, President, states:

"*Texaco Cleartex Oil* has been in use in our plant for over eight years, with complete satisfaction. We have taken advantage of its dual-purpose ability and have used it both as a cutting coolant and a machine lubricant.

"The excellent performance of *Texaco Cleartex Oil* has been amply demonstrated. We highly recommend this product as a dual-purpose oil."

Texaco Cleartex Oil is one of a complete line of *Texaco Cutting, Grinding, Soluble and Hydraulic Oils* designed to help you do all your machining better, faster and at lower cost.

Let a Texaco Lubrication Engineer help you gain these benefits for your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

COMMERCIAL SCREW MACHINE PRODUCTS makes automatic screw machine products for the radio, television and automotive industries. *Texaco Cleartex Oil* is giving outstanding results as a dual-purpose oil in small, high speed Davenports and larger Cones and Gridleys, machining a wide range of materials including 416 stainless and the tougher machining alloy steels. Excellent finish and extended tool life are among the benefits reported.

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TUNE IN . . . TEXACO STAR THEATER starring JIMMY DURANTE on television . . . Saturday nights, NBC.

Are Plant Maintenance Costs on Another Upward Spiral?

IT BEGINS TO LOOK as if the answer to the above question is *yes*. At least all the reliable direction signals that FACTORY's editors can get their hands on indicate that maintenance costs are steadily swinging upward.

Already the figures in FACTORY's Cost Index of Plant Maintenance have hit successive records for the past three months. And figures in this issue (see page 152) have hit an all-time high.

What's the reason? That's a hard question to answer with precision. But, on the average, labor costs have been somewhat ahead of material costs. For example, the labor component of the total index is 155.9, whereas the over-all buildings and facilities component is 145.0 and the equipment index is 150.8.

In one sense it is a hopeful sign that labor costs are somewhat more important as an inflationary factor. That is because labor costs are susceptible to greater control in your own plant than are basic material costs. In fact, by using sound management techniques, it's possible to compensate for higher labor costs by increasing the productivity of the maintenance force.

What are these productivity-raising techniques? Good work scheduling is one. Another is maintenance work measurement. And you will find another brand-new one in this issue (see "Universal Maintenance Standards," page 98).

But, regardless of what technique you use, you can be sure of this:

There never has been a time when smart maintenance management has been more needed. And, the higher maintenance costs go, the smarter you'll have to be to control them.

New Techniques Grow Up Fast Today

JUST A COUPLE of years ago "operations research" was a brand-new name to most plant operating men (see FACTORY, October, 1953, page 113). If it meant anything to the average operating executive, it was merely a "long-haired" way of solving production and maintenance problems with the help of complicated mathematical techniques.

But what has happened since shows up dramatically how fast the art and science of factory management is progressing. And points up the growing interest there is among aggressive and progressive operating men in learning more about anything that promises to be a better management tool. For example:

. . . Two recent conferences, one by the Society for Advancement of Management in New York, and the other by a private consulting company in Pittsburgh, could not accommodate the number of operating men who wanted to attend.

. . . A survey conducted by Case Institute of Technology among 147 companies known to be interested in operations research reveals: (a) 85 of the 147 are actively using operations research *right now;* (b) 57 have worked on problems of production management using operations research; (c) 8 have worked on problems in human relations.

. . . Membership in the two professional societies in this field has also gone up. More operating men are getting active in the Operations Research Society of America, although no summaries are available on the size of the trend. And the Institute of Management Science reports that 600 of its 900 members hold full-time jobs in manufacturing.

This kind of information certainly takes the props out from under any inclination you might have to take it easy and rest on your laurels. You just can't afford to. Especially since operations research is merely part of the fast-growing management technology that will pass you by if you're not on your toes.

Why All the Shouting?

THOUSANDS of companies and local unions have negotiated contracts this year. The overwhelming majority of these peaceful settlements have scarcely aroused a ripple of attention. That's the usual pattern.

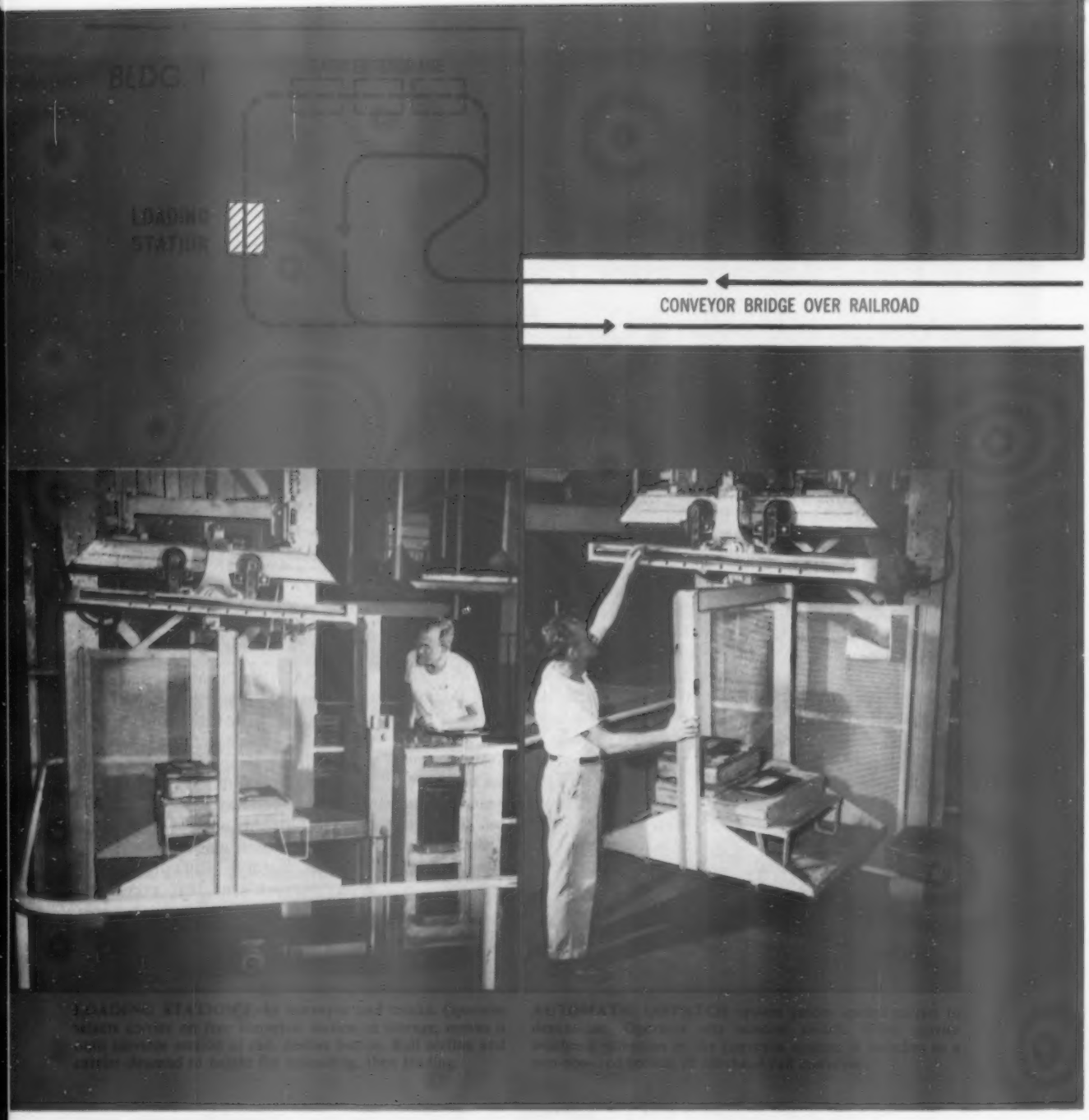
There have been strikes, too. Almost 3000—in one of the most peaceful years in management-labor relations history. But most have been characterized by even-tempered bargaining and quick accord.

But let one company have a strike that doesn't fit the peaceable pattern. Like the flare-up between UAW-CIO and the Perfect Circle Company at Newcastle, Ind. There's some violence. Strikers and nonstrikers shout recriminations—and fire guns—at one another. Then what happens? The strike hits the headlines all over the country—and in other parts of the world, too.

Result: One little strike, involving fewer than 250 workers, makes more front pages than all the thousands of peaceful settlements.

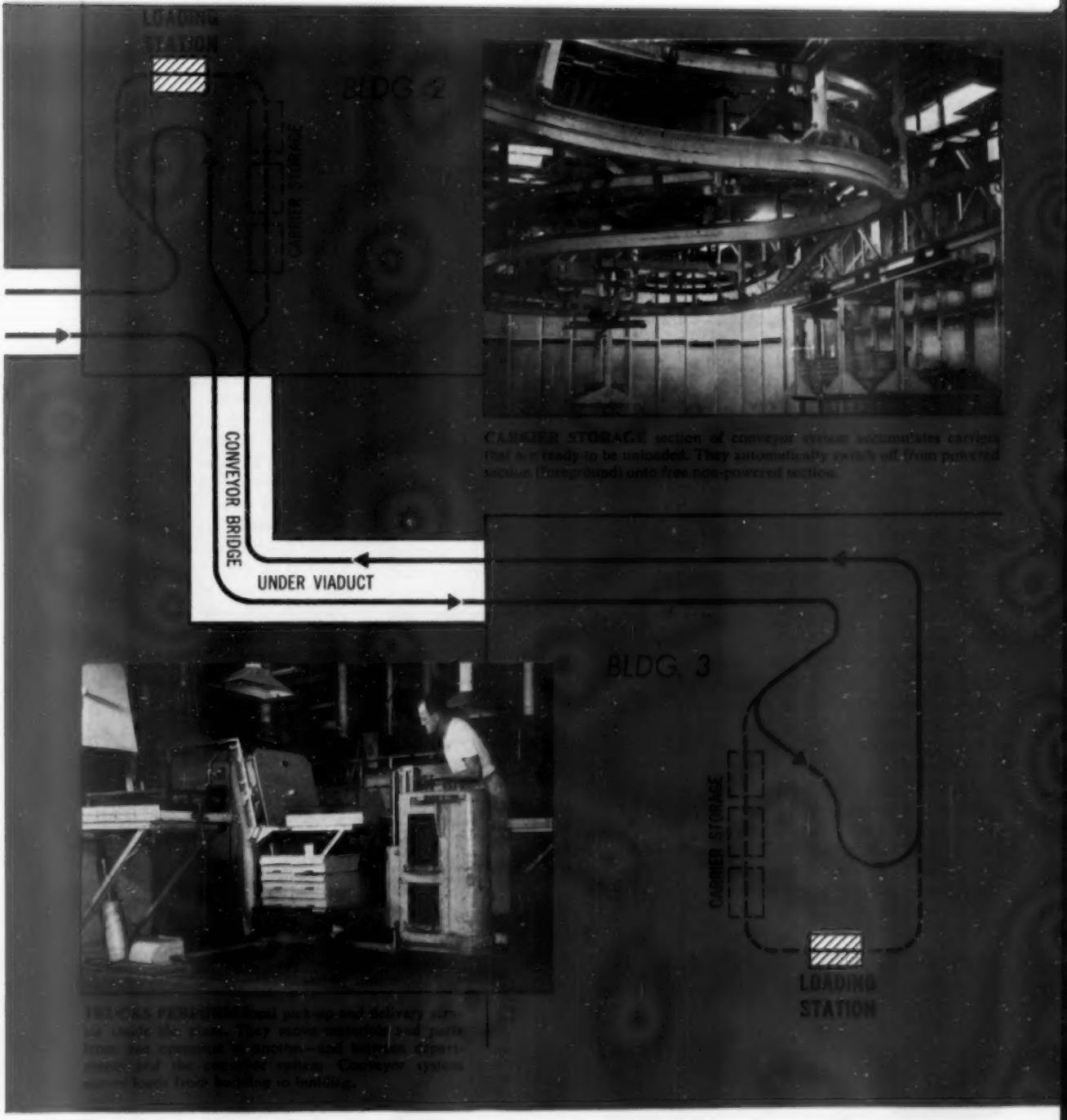
So let's not get misled by the noise. We *have* made great progress in our labor relations. And, despite a noisy exception, we're getting more mature about it every year.

That's the *real* headline news, though we doubt whether any newspaper will print it.



Teaming Up Trucks and Conveyor

A new conveyor speeds from building to building and teams up with a fleet of trucks to put IBM handling costs through the wringer. Boosts output and safety, too.



CARRIER STORAGE section of conveyor system accumulates carriers that are ready to be unloaded. They automatically switch off from powered section (foreground) onto free non-powered section.

TRUCKS PERFORM internal pick-up and delivery service inside the plant. They move materials and parts from the conveyor terminus—and between departments not served by the conveyor system. Conveyor system moves loads from building to building.

WHEN A CONVEYOR teams with industrial trucks, down go the handling costs! At least that's what's happening today at the Endicott (N.Y.) plant of International Business Machines Corporation.

The conveyor in this case is a power-and-free unit (installed by Mechanical Handling Systems, Inc., Detroit). It's 1500 feet long. It cost about $260,000. It will pay for itself out of savings in six years. It makes all inter-building moves (see diagram). And, in so doing, travels over a railroad, under a village viaduct, and right through three plant structures.

The trucks, on the other hand, make intra-building moves—mostly short hauls from conveyor to machine, from one operation to the next, then from machine to conveyor.

Payoff — Following are specific benefits and advantages:

. . . Better utilization of lift trucks for short-haul movement of parts within processing and storage departments. This elminated need for four more trucks and operators.

. . . More flexible linkage between

machining and assembly. Now parts can be moved up to two times faster.

. . . *Safer operation.* A power-and free-conveyor is loaded and unloaded with the carrier not moving. This eliminates the hazard found in conveyors that must be loaded and unloaded while moving, or shut down completely on each occasion.

. . . *Savings in manpower.* Instead of requiring an operator in attendance at all times at each loading station, one man can load, unload, and truck parts coming off the conveyor while allowing incoming carriers to remain on the free storage loop in his absence.

. . . *Speed not governed by any one station.* The power-and-free conveyor always moves at full speed while the work pace at each station, which may vary with the work load, is accommodated by surge space on the storage loop. This also reduces delays caused by waiting for an operator to unload carriers.

The systems—IBM's new conveyor is about 1500 feet long, including 150 feet of free sections. Latter are used for temporary storage of carriers until they can be unloaded, or until a related group of carriers is ready for release to another plant location. Two power units move conveyor at 18 feet per minute. Total horsepower is six.

. . . *Carriers.* Pusher dogs on the conveyor, spaced at 15 feet, move the carriers on the power sections. The flat bottoms of the carriers are 3x4 feet. They take skid boxes, loaded skids, and tote pans, all of which are used in the Endicott operations. Each carrier will carry loads up to 2000 pounds.

. . . *Load-and-unload stations.* There's one in each of three buildings. A dispatch-switch system in the conveyor permits assignment of a carrier to a specific station. When it reaches the station, it's automatically switched off the powered "main line" onto a free section of conveyor. There it waits for a truck operator to unload the carrier and take the load to its destination within the department. If necessary, he can set the load aside at the station, deliver it later.

Empty carriers are manually switched and moved to an adjacent section of free conveyor. Lift trucks set loads on carriers. Operator sets destination selector on carrier. To start it on its way, he pushes release button and the carrier moves to transfer position. When empty position on main conveyor approaches, switch is automatically moved to transfer position and carrier moves onto main conveyor.

Truck operators operate load-and-unload stations. No other attendants are required.

. . . *Trucks.* A fleet of 120 industrial trucks provide the integrated link between the inter-department conveyor and the processes. Trucks include several types—fork lift, high-lift and low-lift platform, and walkie pallet trucks. Capacities range from 2000 to 6000 pounds. All trucks are assigned to specific departments.

Trucks do not move parts from departments located in the heat-treating and plating building to other departments in the other plant buildings. The conveyor does all that work.

Three electric trucks move parts between departments in heat-treat and plating buildings where distances are relatively short. The conveyor handles all other movements of materials between major buildings, but not between departments.

The conveyor makes the long hauls, trucks make the short ones.

How it works — Parts leaving specific machining operations are trucked to the conveyor loading area close by. All such loads are accompanied by an operation-sequence card that shows the next destination. The trucker places the parts on the conveyor, pre-sets the carrier for its correct destination. The carrier then moves onto the conveyor.

At the pre-set unloading station, the carrier moves to the free storage loop for unloading. After unloading, it's trucked to the next operation, after which the sequence starts over again.

The important thing here, aside from the pure movements, is that the conveyor has eliminated not only time and area needed to sort loads according to destination, but also midway points where stock might require re-sorting while waiting for elevators.

Who determines when a load should go onto the conveyor? All jobs within the plant have a sequence of operation by specific date. No definite procedure is necessary at the conveyor. As fast as parts arrive, the truck operator places them on the conveyor to send them to the next operation.

How does a receiving department know when to expect a given load? The complete manufacturing operation of any given part is dated as to starting time, operation time, and finish date. However, it is not necessary for the receiving department to know when a given load is expected to arrive.

OVER THE RAILROAD goes the conveyor as it passes from one building to another. At another point it passes beneath a village viaduct. Fact is, it makes all inter-building moves among three plant structures at IBM's Endicott plant.

Better Handling for Small Parts

Spending big money to move small parts? Then you'll snap up these two simple tricks that save labor and storage space for Parker Appliance.

COSTING YOU more to handle small parts than the parts are worth? It won't if you keep getting ideas like these two at Parker Appliance Company, Cleveland. They're from a non-stop program that makes it easy to cure that particular headache. How? Keep devising better methods, says Parker.

NEW BINS CUT STORAGE SPACE

Parker likes these bins because they halve space needed for storing forgings. Also cut handing costs 25%, speed rush order jobs.

Bins cost $100 each. Each holds a different type of forging. They can be moved by overhead crane. Crane control above operator's head (not shown) lifts lugs at corners of each bin. Bins are filled by up-ending drums with crane. Each holds seven drums of forgings.

As forgings are needed for machining, a gate at bottom of the bin is lifted to let them flow into a tote pan. Pan is then shoved along conveyor to scales for weighing.

Formerly forgings were kept in drums, which wasted raw-material storage space. Crane dumped forgings from drums into tote pans—a laborious job. And it was a problem to find the right drumful.

SPECIAL TONGS STACK TOTE PANS HIGHER

These welded steel tongs pick up four tote pans at once. Tongs are suspended from a hoist. The operator slips them under the handles of the bottom pan in a stack of four—and away go the pans. Cost of tongs: $5. With this new method Parker now stacks tote pans 18 high in a finished-goods storage area. Former limit was 12.

Tongs also save labor during inventory. One man removes pans from stacks, weighs them on a scale that's built into a conveyor, then restacks them. Formerly this job often took two men. They placed pans on a hand truck, hauled them to the scale, put them back on the truck, restacked them by hand.

CONVEYORIZED INSPECTION LINE stretches 40 feet across floor, enables Solar to spot circular and longitudinal flaws in compressor vanes that flow past inspectors at high speed. Inspectors work in hooded booths lighted by fluorescents.

Inspecting Six Times Faster

By conveyor. That's the secret of Solar's high-speed, high-volume magnetic inspection of jet-engine parts. And Solar can double output if called on.

TAKES ONLY TWO inspectors now to pass on 5000 jet-engine compressor vanes per day at Solar Aircraft's plant at Des Moines. That's six times as fast as inspections used to run.

Secret of the new high speed is conveyorization of Magnaflux inspection (see photos). Took place about the first of this year. Had to, when Solar-Des Moines began producing vanes and shrouds for J57 jet-engine compressor assemblies. Each assembly requires 1500 to 2000 vanes. Speed therefore was a "must." Today, with conveyorized magnetic-particle inspection doing a high-speed, big-volume job on vanes, other Magnaflux inspection apparatus is released for work on larger components—bearing housings and supports, compressor ring flanges, mounting brackets, and roller segments.

Even if vane output were nearly doubled, the 40-ft. conveyorized inspection line still could carry the load. Because only two of the four inspection booths are manned at present. Using all four would boost

inspection capacity to 7000 or 8000 units per day.

How it works—Nothing new about Magnaflux inspection at Solar-Des Moines. Been used since 1942 for inspecting aircraft exhaust manifold assemblies, torpedo racks, etc. And it's been used to inspect vanes ever since 410 stainless was developed for the J57 engine. But conveyorization is new. There are six steps in the Solar process:

. . . 1. *Vane is magnetized by clamping it* between two contact plates that set up a circular magnetic field around it. As the vane is magnetized a continuously flowing ferro-magnetic solution—iron particles suspended in a light oil—cascades over it. Magnetization causes particles from the solution to bunch up on any longitudinal defect in the vane—surface or internal.

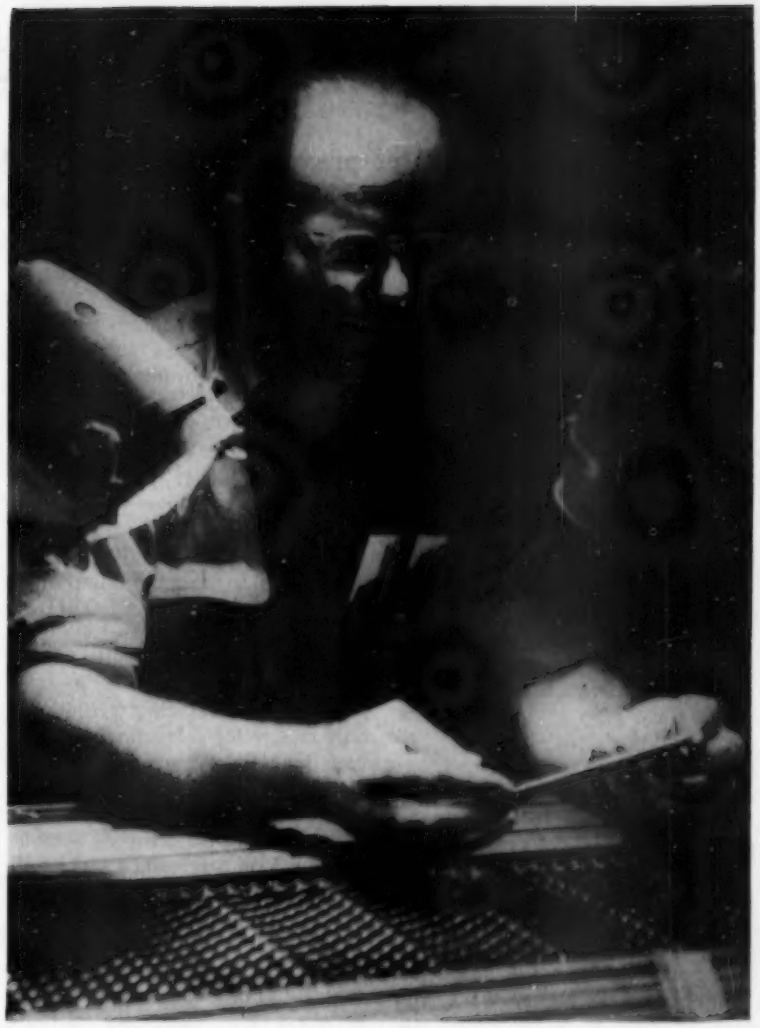
. . . 2. *Operator places vane on conveyor,* which carries it to Inspection Booth No. 1. Booth is hooded, equipped with a fluorescent light. There, Inspector No. 1 (government-certified) scans it for any accumulation of magnetic particles that betray longitudinal defects—cracks, seams, laps. He rejects it—or passes it.

. . . 3. *If vane passes first inspection,* conveyor carries it out of Booth No. 1 and into Booth No. 2. But between the two booths another continuously flowing ferro-magnetic solution pours over it. At the same time, it passes through a longitudinal magnetic field. Magnetic particles from the solution cluster around any circular defects.

. . . 4. *Vane rides conveyor into Booth No. 2.* There Inspector No. 2 (also government-certified) checks it under fluorescent light for circular defects, passes or rejects it.

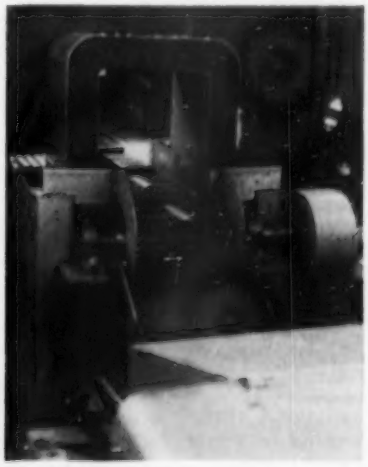
. . . 5. *Vane rides through an open-coil, box-type demagnetizer,* with longitudinal axis of vane parallel to magnetic field around coil. This demagnetizes vane.

. . . 6. *Vane is washed clean* of solution and magnetic particles, passes beneath an air blast for removal of moisture. Air blast eliminates hand-drying.



FLUORESCENT LIGHT in inspection booth spots clusters of iron particles that cling to any cracks, seams, or laps in the vane. Inspector passes or rejects vanes.

VANE IS MAGNETIZED by clamping it between contact plates. As solution flows over it, iron particles cluster on flaws.



VANE IS DEMAGNETIZED after inspection. Next a washing to remove solution from vane, an air blast to dry it.

Better Way to Run Your Job

Can't be in three places at once? Delegate's the magic word. Take it from a top consultant. He'll save your sanity, make you a better plant executive.

HERE'S A PICTURE of you at work: No matter how good an executive you are, your responsibilities will always be greater than your capacity to carry them out.

That's not a criticism. It's an accepted fact. No one expects the company president personally to produce, package, and sell his product. No one, that is, except an occasional overburdened company president himself.

The encircled man above shows the situation graphically.

Outer circle represents the limit of your responsibility; inner circle, the boundary of your capacity. White area represents work you must delegate to others—your secretary, assistants, subordinates.

Occasionally you'll find a man who refuses to accept this simple fact of executive life. He won't delegate. He'll strive with all his might to push the inner ring outward in an attempt to make the two circles coincide. And he'll complain:

. . . *"I have to be in three places at once."*

. . . *"I don't dare take a day off."*

. . . *"I've got ulcers."*

You'll also find executives who head for trouble in the opposite direction. They over-delegate. You've heard their cry:

"Why doesn't somebody tell me these things!"

By AUREN URIS
Research Institute of America, New York

Adapted from a chapter of author's newest book, "Developing Your Executive Skills." McGraw-Hill Book Company, New York.

The trick of delegation is to concentrate the most important matters within the circle of things you handle yourself. The less important details can be left to others while you give the weightier problems the attention they deserve.

Delegation is a sanity saver for several reasons. It gives you freedom of action, allows you to turn your attention to the areas of your job that need it most. It gives you more time to spend on important long-range planning.

HOW DELEGATION BUILDS A TEAM

But greater efficiency isn't the only motive for delegating a part of your job. Enlargement of a subordinate's job can produce three other important results for him:

. . . *Develop his sense of responsibility.* You may want to make an assignment purely in the interest of increasing his ability and value to your activity as a whole.

. . . *Enlarge his general understanding.* For instance, the best way to stress the importance of customer relations for one of your assistants might be to ask him to take over customers' complaints.

. . . *Increase his job satisfaction.* Some subordinates thrive on varied assignments. Their interest in the job increases along with its responsibility. Delegation of small projects helps maintain their effectiveness as team members.

Used in these ways, delegation is another means of getting employee cooperation.

Properly handled, delegation guarantees that your over-all job will remain in control and that the people working under you will keep moving in the right direction. But there are hazards.

You'd be wrong for example, to assume that delegation is a one-shot affair. You can't delegate and forget. Chief reason is that your responsibilities change. New problems come up, make fresh demands on your time. You must be ready to review past delegations. You may have to make corresponding changes in tasks you've assigned to others.

WHEN TO DELEGATE

There are specific occasions in the course of your work when delegation is called for. Here, for example, are three instances:

. . . *When you're overburdened.* It's a safe general rule that you simply can't handle all your responsibilities and still do a good job on the important ones.

. . . *In emergencies.* Your first thought may be to let everything else drop. Yet the temporary suspension of even a routine matter may leave you with too big a backlog when the crisis is over.

. . . *In your absence.* It might be a two-week vaction—or a series of conferences. But someone will have to provide minimum authority while you're gone.

As a starter, check up on the time you spend now in: (a) filling out routine reports, requisitions, etc.; (b) making calculations and entries; (c) checking materials and supplies; (d) running your own errands; (e) engaging repeatedly in certain simple, mechanical tasks.

If you can reduce any of these tasks to a matter of final O.K., a signature, or dispatch of a messenger, consider handing them over to some subordinate.

WHEN NOT TO DELEGATE

There's another side to the delegation coin. Just as there are situations for which delegation is a solution, there are circumstances that make it inadvisable.

Delegation can cause trouble if you hand over the wrong duties. Some of your responsibilities are yours for keeps:

. . . *Power to discipline.* It's the backbone of executive authority.

. . . *Responsibility for maintaining morale.* You may call upon others to help carry out assignments

that will improve morale. You cannot ask anybody else to maintain it.

. . . Over-all control. No matter how extensive the delegations, responsibility for final performance rests on your shoulders.

. . . The hot potato. Don't ever make the mistake of passing one along just to take yourself off the spot.

You must retain some jobs. It's best to hang on to them, if . . .

. . . They are too technical. Computing a floor load or projecting a cost estimate may be routine for you—but may be completely beyond a subordinate's skill.

. . . The duty involves a trust or confidence. For instance, handling confidential cost data, dealing with the personal affairs of one of your people.

To keep things moving at full blast, you may find it necessary at times to delegate duties involving initiative, judgment, and decision. But consider these factors: (a) the duty to be delegated, (b) the ability of the person it will go to, (c) your ability to keep control—that is, to keep posted on progress.

HOW TO DELEGATE

To get the most from delegation, tell your delegate . . .

. . . The facts. Give him a clear picture of what he's to do, how to do it, and how much authority he has with which to get it done. "You never told me" is the sorry epitaph on many a well-meant delegation.

. . . The relative importance of the job. You know how important a job is because you see it in the setting of your whole responsibility. Your delegate can't make the necessary adjustments when he runs into trouble unless you have given him the complete background.

. . . Whom he must deal with. If the assignment will bring him into contact with new people—for instance, men in other departments—introduce him in these places yourself. And be sure you let everybody involved know that they're to deal with your subordinate.

. . . Why you picked him. In other words, prepare him psychologically. He may feel an excessive weight of responsibility. Lessen the tension by removing his sense of crisis. Show your confidence in his ability—that's why you picked him. Reassure him from time to time. And emphasize your availability whenever he's in doubt.

Get others to cooperate—Often the responsibility you assign does require a certain amount of authority over others. It may be minor, but even a clerk—trying to collect figures for a report you want to make—is likely to find people with their backs up, slow to cooperate.

To avoid conflict, follow these simple rules:

. . . Define scope. Specify the exact nature of the duties and authority you are delegating. That's essential to keep your delegate on the right track. He may think you're handing over your job unless you tell him what's what.

. . . Tell the others. Define clearly and publicly the limits of the authority you delegate. And take care of complaints about overstepped boundaries promptly.

Set harmony as a goal—Reserve the right to discipline. Don't let your delegate try to enforce cooperation. Impress him with the importance of working harmoniously with other members of your team. Sell your people on the need for delegating the job.

Keep control—When you delegate, you don't really get rid of responsibility. You must still keep control. You'll need it in order to get coordination—to make sure the assigned task ties in with other objectives you have in view.

Your instructions must include a standard operating procedure—actual rules by which the subordinate can handle the situations that constantly recur. Examination of the results is the easiest kind of control you can exercise. You simply look at the completed performance.

It's a sort of "hands off, men working" policy, used where your assistant is highly capable or where the task is largely mechanical.

. . . Follow-up. Often it isn't wise to wait until performance is complete. Errors may be too expensive, too hard to correct. You may want to check progress by inspecting, sampling, spot-checking. This is especially good where responsibility is new, large, or hard to handle.

. . . Progress reports. For a variety of reasons—time element, location, etc.—you may prefer to have your subordinate report on how he is making out. Such a report may be frequent or infrequent, written or oral, in person or by telephone. You must decide what will be adequate under the circumstances involved in each case.

CHECKLIST FOR DELEGATION

Occasionally you may find yourself too wound up in controls, too badly snarled in red tape. Ask yourself these questions:

. . . Have I delegated duties I can more efficiently handle myself? When you have to follow up with constant observation, the game of delegation isn't worth the candle.

. . . Are my delegations boomeranging? When you pass a sizable task to a worker, you may have to give him an understudy. Otherwise, when he's absent, the delegated duty comes home to roost.

. . . Have I set up the right controls? Ability to make controls work effectively—is the real test of executive leadership. Measure any questionable control by these tests:

Duplication. Is this control necessary? Do you get the same information elsewhere?

Reports. Are you getting long, rambling, time-consuming reports?

Delayed control. Are you relying on "control by result" in a delegation where damage can be done before you can act?

Frequency. Are you checking too often on unimportant matters? Facing a pile of progress reports you just can't read?

BE PREPARED FOR TROUBLE

Delegation is no bed of roses. So prepare yourself for trouble. It'll range from the trouble that makes you shrug to the trouble that makes you shudder.

If a man buys an article for $7.75 and sells it for $9.25, does he gain or lose? You remember the schoolboy's answer to this question: "He loses on the cents, but gains on the dollars." Frequently, with delegation, you face a similar situation. You lose on the cents (short-range) but the gain on the dollars (long-range) makes it worthwhile.

Face it. The man you delegate won't do the job the way you would. Even if you've given complete instructions, don't be surprised if many a delegated assignment ends up in unexpected fashion. If you're inclined to throw up your hands, don't. It's probably time for you to reassess your delegation procedures.

HOW'S HIS SEE-ABILITY? Optometrist Meals (our author and consultant in charge of occupational vision program at International Harvester's Springfield Works) checks focus of lathe operator Schutte's safety goggles against working distance.

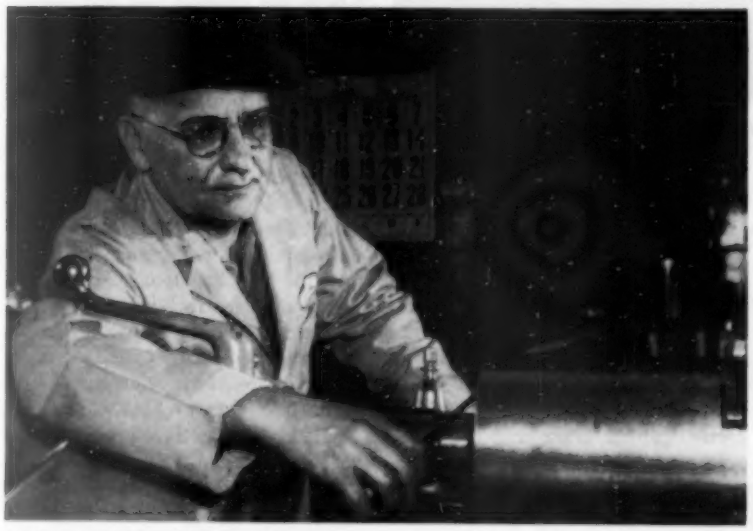
Fitting Eyesight to Job Needs

A vision control program will help you track down men with poor eyesight, fit them to the right glasses, and put them on jobs where 20/20 eyes aren't vital.

DOES THE SEARCH for material and mechanical waste in your plant blind you to the waste of human effort caused by defective eyesight? Do you make a systematic effort to find out if a worker's vision is suited to his job? Or do you assume that just because his eyesight was perfect nine years ago when he was hired, it's still satisfactory for close work today? If you do, you may be wasting his productivity by damaging his accuracy, comfort, stamina, posture, and health. An up-to-date occupational-vision program, on the other hand, may help you quickly reap the benefits of greater productivity, less downtime, reduced costs, and improved quality.

By WILLIAM MEALS
Visual Consultant to International Harvester Company, Springfield, Ohio

BEFORE VISION CHECK. Lathe operator Schutte (a farsighted fellow) has to squint like anything in order to read a simple dimension at ordinary working distance.



AFTER VISION CHECK. Schutte has now been fitted with prescription goggles; with their help he can do more accurate work, without eyestrain — and fatigue.

Success stories—Take the experience of these four companies who have vision control programs:

. . . *Deltox Rug Company,* Oshkosh, Wis., found that 156 of its 356 employees had an average visual acuity of 76.5%. (Means that if 20/20 vision were 100% and 20/40 were 50%, average vision rating would be 76.5% or approximately 30/40.) All these employees were sent for an eye examination: 122 had correctable defects—and were corrected to at least a 92.5% visual acuity. Deltox reports that absenteeism has decreased by approximately one-third. And, in 20 cases where absenteeism was due to headaches, fatigue, and nervousness, the cause was apparently removed. All 20 people worked months without a lost day after receiving visual aid.

. . . *Shell Pipe Line Corporation,* Houston, with 2757 employees, put in a complete vision program for a total company cost of $2491.15. In one year, reduction of eye-injury treatment and compensation saved $4057.41.

. . . *Riegel Textile Corporation,* Riegelsville, N. J., says "57% of our people with defective vision are poor producers; only 11% of the good producers have deficient vision."

. . . *Diamond Chain Company,* Indianapolis, after starting a vision program, found during the first eight months of 1948 that it had 20,000 pounds less scrap than during the first eight months of 1947, an improvement of 11%. This was accomplished in spite of a substantial increase in production during the 1948 period.

One out of three—In business and industry, inadequate eyesight is a handicap to at least one out of three employees. If you just assume the employee has good vision, or if you take it for granted he is visually qualified for the job, you gamble with expensive equipment and with human lives. The cost of a single accident in your plant might well pay for an occupational visual program. With such a program the degree of visual effectiveness of each employee is known. And with this knowledge you can place him on a job of proportional visual demands.

Occupational vision is "the application of see-ability to productivity." Properly assayed and used, it is a tremendous asset not only to the employer but to the employee as well. It should be of great concern to each. See-ability is necessary, whether the employee is running a machine, operating a crane, or working on an assembly line. If the worker can't see properly for the job, he can't produce to the best of his capabilities. And, often more serious, see-ability has an effect on quality, accident rates, and job satisfaction.

Physical qualifications and health requirements for workers vary with the size of the company and the interest of management. In most companies a physical examination is now a preliminary step in the hiring of new employees. And the physical examination of the prospective employee usually includes some kind of visual analysis. Trouble is, all too often it's an entirely superficial one.

In fact, it's not unusual for a company to hire a man with only half vision, without a suspicion that the condition exists. Not that there's anything wrong with hiring a person with one eye or poor vision *if* he is placed on a job requiring only that degree of visual efficiency.

Turn the page

VISION CHECK shows inspector holding clipboard has no trouble seeing man under car. But to fill out his record, he ought to wear bi-focals—and soon will.

How to Set Up a Good Vision Program

First ask these questions about your company's present method of testing for visual efficiency:

How is an applicant's vision measured when he's hired? In many plants, a card is held over one eye. He is then asked to read the letters on a standard eye chart at the end of room. He repeats the performance with the card held over the other eye. The Snellen letter chart read at 20 feet is of little or no value as a test for vision for most industrial jobs. Most tasks requiring high visual efficiency are performed within arm's length. It's the *near* point rather than the *distant* one that is vital in occupational vision. Insistence on 20/20 distance vision in each eye is silly when hiring a girl to run a sewing machine or to do other similar close work at 16 to 18 inches. A nearsighted person of 20/40 distance vision can often do a better close-range job than one with good distance vision.

Do you test for field or range of vision? This is the ability to see to both sides and up and down while focusing the eyes on a definite target. It's best to know beforehand, if only for his own safety's sake, if your new employee has an adequate field of vision for the job he has to do.

What type of check is made to determine "depth perception"? This is of vital importance to the truck-driver and the crane and press operator. It's important for accuracy in almost any job, and essential around dangerous machinery.

An employee with one eye has little or no depth perception and cannot judge distances as well as a man with good vision in both eyes.

Do you check for color blindness? About 8% of all men are color blind, but only 0.5% of all women. Good color vision might be a requisite for certain jobs in your plant. It's of vital importance when hiring assemblers who use colored wires (as in radio or television manufacture), as well as other colored materials. It's also vital for painters, printers, and all types of drivers.

Do you check to determine if your new employee is able to make his two eyes work together? Without this balance, the vision is likely to be inaccurate. The person may tire quickly when an unusual burden is placed on the one eye. This can be the cause for example, of an unusually high percentage of rejects from a production-line worker late in the day.

Many people have a tendency to be cross-eyed and still have good vision in each eye. Under undue strain or an emotional upset, the weak eye will cross and good binocular vision will be lacking. Technically this person becomes a one-eyed person when this occurs. The usual test where a card is held first over one eye and then over the other ordinarily will not bring out these defects and the person who has any of them will be passed as having good vision. A skilled member of the optical profession, using the necessary instruments, can interpret the findings and give proper advice for placement of this type of employee.

Practically no one combines all the elements of good vision to form what we might call "perfect vision." Some excel in visual skills needed for one type of work, while others are superior for another. To achieve maximum production, visual capacities of your employee must be matched to visual requirements of work to be done.

Caution: Be sure that the person charged with making your eye exams really knows what you want. The Kenosha (Wis.) Auto Transport Company assumed for years that the yearly physical examination of drivers included an adequate vision check. Actually, when an intensified vision control program was set up, 4 of 47 were found to be blind in one eye. No record of this condition had been noted previously simply because it took an alert professional to uncover it.

Nine points to check—No single vision program will properly apply to all types of industry. Each plant will present its own problems. But any program aimed at guaranteeing the highest visual efficiency in employees should:

1. Test visual skills.
2. Analyze visual demands of specific jobs.
3. Correlate visual skills and job demands.
4. Place employee on job for which he's visually qualified.
5. Test employees now on job.
6. Recheck periodically to determine visual changes.

7. Refer employees requiring refractions and prescription of corrective lenses—to an optometrist.

8. Refer employees with pathological eye conditions—to an oculist (medical eye specialist).

9. Report to management on results and findings, in language it can understand, of visual conditions of employees.

A word of warning: Fitting a worker's eyes to his job requires an expert trained not only in optometry but also in its industrial applications. It is unwise to embark on a vision control program solely from a money-savings viewpoint. You'll do better to be sure that the person you select is fully qualified.

Protecting eyes—Visual testing and assignment of workers according to its findings should be only one part of your over-all eye utilization program. Equally important is protection of that vision.

Many plants, both large and small, have dozens of "plano" goggles distributed throughout the working areas. I have seen a pair hanging above a grinder for the use of anyone who operates the machine. This practice is dangerous because eye infections can be spread throughout plant. Each man who needs protective goggles should receive his own pair, properly fitted for maximum comfort. Issuing goggles for a tool crib with little thought to bridge and lens size will give employees good reason for complaints about discomfort.

Many employees need a correction ground into their lenses or prescription safety glasses. It's faulty practice to ask the worker to get a copy of the prescription glasses he wears on the street or at home. Working distance and reading distance can vary greatly. This factor can be critical, as in the case of the employee of 40 or over who wears bifocal lenses and has a working distance of arm's length. His dress glasses have bifocal distance set for comfortable reading —from 16 to 18 inches. This is not suitable for seeing clearly at 28 inches—his "normal" working distance. Such a condition can cause a mental as well as visual strain and result in sloppy workmanship. It's also the cause of serious accidents.

Avoid using an employee's present prescription without having it updated. It may be several years old—of little value now in bringing out his maximum visual efficiency for work. Arrange for an eye examination and a new correction prescription for use on the job.

Do you allow your employee to show up with a pair of safety lenses in a dress frame? If you do, you may be letting him wear a highly inflammable frame — one not designed to hold safety lenses securely and not recommended for on-the-job use. These glasses may give employer and employee a false sense of security because neither realizes the inherent danger.

You're not too small—Some people think that an occupational vision program is for big plants only. Not so. Regardless of how few are on the payroll, small plants have just as much right as big ones to insist on good worker vision.

An electrical contractor in the midwest is a good example. He never has on his payroll more than 11 men. For lack of a proper working lens, one of his men died. This electrician, 48 years old, worked on overhead outlet boxes at a height of approximately 30 feet. Standing on a ladder and working at an eye distance of 10 inches, he had to lean back to bring his work into the lower bifocal area of his glasses. He leaned back—just a little too far—and fell to the floor, landing on the back of his head and neck. Had he been fitted with double bifocals, he would have been able to do a good job from a safe position.

Adopt a policy—and stick to it. Start your program with as few bugs as possible. Get the advice and counsel of your safety director. Since he knows the danger points in the plant, a close association of his ideas with those of your vision consultant should be correlated and used to greatest advantage.

For instance, you should decide in advance which employees are to receive corrective protective lenses, which type of frames are to be used, and which employees are to receive bifocals. To supply bifocals to a man whose job it is to clean up the yard is a waste of money.

How much? You will find that the old concept "Free Examination—Glasses as Low as $5.98" is a thing of the past. Optical service fees will vary depending on location of plant, number of hours required to carry out program, number of employees, extensiveness of program, etc. Because of individual company conditions it's hard to predict exact cost.

There are several methods of paying for optical services. Your company may find that it would be best to pay for all services and materials. Some plants pay for materials only; in others, this cost is shared by the employee.

Many plants find it advantageous to hire an optometrist or an oculist as a vision consultant. He is paid a fixed fee per year and devotes a certain number of hours to your employees weekly. A minimum fee of $10 to $15 per hour is typical.

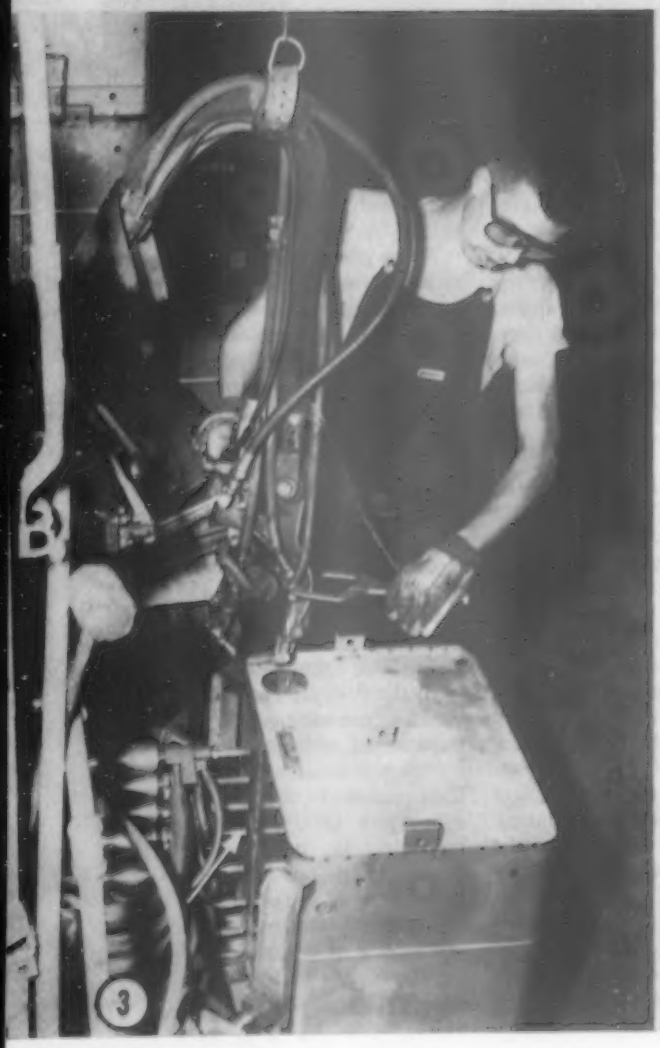
International Harvester's experience

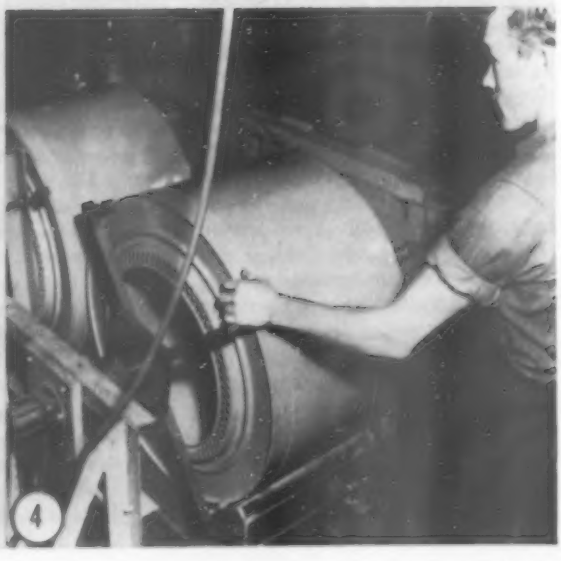
For years the International Harvester plant at Springfield, Ohio, had a vision program. All factory employees (about 3500) and all others entering the working area are required to wear safety glasses. Employees who need prescription lenses are furnished them at full cost to the company, including examination fee. Until three years ago, employees were sent out of the plant for optical services for safety glasses.

But in 1952 I-H purchased the necessary examination equipment and set up an optical room in its own dispensary. It retained a vision consultant on an annual fee basis. He spent regular hours in the plant, was thus able to anticipate the visual problems that arose.

With this new program I-H made a direct dollar saving annually of more than $5000 over its former method. In addition it has protected itself against possible disability claims. For example:

In the first year of operation under the new setup, 12 employees were found to be blind in one eye. No such indications were shown in their records. In the case of a serious eye injury Ohio laws require the company to produce a record documenting the employee's per cent of vision before the injury. Otherwise company is liable for 100% loss of vision. So I-H is now sure of the limit of its liability should any of these 12 workers suffer an eye injury.





Boosting Output 200-500%...

... is always a good trick if you can do it. Norge did. And credits a never-stop methods improvement program—like the one *you* might start up this fall.

NO INDIAN rope trick here. Norge Division, Borg-Warner Corporation, gets higher output, saves floor space, and cuts costs with better handling, plus automatic and semi-automatic processing machines. Four of Norge's improvements (you'll probably latch onto a couple or more for your own plant) are pictured on the left and described here. They're just a few of the changes that boosted dryer output 500%, doubled range production in 6 months. No increase in floor space—though employment is up from 500 to 1300.

1) Triple-Play Conveyor

Problem—Streamline assembly of dryer front panel. Locate operation near main dryer assembly line.

Old method—Subassembly work done on benches some distance from main conveyor.

New method—Entire subassembly of front panel is done on two auxiliary conveyors running parallel to main assembly conveyor. Air ducts are assembled on 20-ft. variable-speed belt conveyor at left. When completed air ducts reach end of this conveyor (traveling toward you), a felt seal is inserted. Then subassembly is lifted to the middle conveyor.

Middle conveyor is a 40-ft. belt conveyor (moving away from you). Outside panel, air duct, and door are assembled as subassembly moves down belt. Parts are brought to workers on hand trucks. Number of operators on these two auxiliary lines varies with different models.

When panel subassembly reaches end of second conveyor, it is completed. Then worker on main assembly conveyor takes completed front panel, attaches it to a dryer moving along the line.

Benefits — Auxiliary conveyors cut front-panel assembly costs 18%.

2) Automatic Crimping

Problem — Secure felt seal in dryer air duct between two concentric metal rings. Seal fits against cylinder inside dryer.

Old method — Used manual crimping gun. Took about 45 shots to secure each felt strip.

New method — Operator places air duct on fixture. Then hand-fits felt strip between two concentric metal rings. When she presses air valve at right, two crimping arms (arrows) move out against inner metal ring. Depressing second air lever (left) makes crimping device start rotating. As it rotates, rollers on ends of crimping arms force inner metal ring outward against felt. This secures it in place.

With release of air levers, crimping device stops rotating and arms retract automatically. The two-hand lever operation insures safety.

Benefits -- A 45% cost reduction on this operation.

3) Spot Welding in Half the Time

Problem — Fabricate oven liners for electric ranges the fastest way possible.

Solution—Operator places formed sheet-metal oven liner around supporting posts of spot-welding machine and pushes "start" button. Machine automatically clamps liner shell in place, welds liner seam in eight places (arrow). Then indexes downward about one inch. Finally makes another 8 welds along seam.

At same time, operator positions rear inside liner and secures it with 60 to 70 spot welds. For this he uses a single-nozzle welding gun. Gun is ceiling-hung on a counterbalanced hoist. When finished, operator disengages holding clamps.

Benefits — Cycle time would be twice as long if done with conventional pedestal welder.

4) Beading With an Automatic Machine

Problem — Get speedy, economical beading around outer perimeter of front and back of dryer cylinder.

Solution — Operation is performed in two steps just before cylinder is put into dryer. First, bead on back is formed by machine at right. Then front bead is formed by similar machine at left. Operation is completely automatic except for loading and unloading machines.

Here's how it works: Operator loads cylinder assembly into first beader. Then pushes button that pneumatically locks cylinder in place and starts driving motor. This power, provided to one roller only, in turn drives the dryer cylinder and thus the other beading rollers. Actual bead is formed as edge of cylinder perimeter passes between several sets of symmetrical rollers.

When cylinder is removed from left machine, both edges are beaded. Then cylinder in right machine is rolled to left machine for second beading step. Right machine is then loaded with an unbeaded cylinder.

Benefits — Minimum labor time. Only direct labor: transferring cylinders in and out of machines.

From the men who developed MTM . . .

HAROLD B. MAYNARD, President

"Mike" Maynard has lots of "first's." Two of 'em: first to publish predetermined time values, first to use the term "methods engineering." He's co-author of four McGraw-Hill books on methods and measurement, author of one soon to be published.

G J. STEGEMERTEN, Vice President & Gen. Mgr.

Methods Engineering Council, Pittsburgh

"Gus" Stegemerten is tops in development, installation, and administration of methods improvement, work measurement, and wage incentive plans. He was long a top staffer for Westinghouse, now a co-worker and co-author with "Mike" Maynard.

. . . comes this newest plant operating tool:

Universal Maintenance Standards

Announced here for the first time anywhere, UMS may well supply the long-sought answer to industry's search for practicable maintenance time standards.

WHEN MAINTENANCE work is studied and standards are established, it is found repeatedly that the average daywork maintenance worker is no more than 50% effective. When the maintenance activity is properly organized and standards are applied to the work in advance of assignment, effectiveness often rises to 90-95%. If the worker is also given an opportunity to earn incentive bonus on these standards, his performance level generally rises to about 125%. Thus his original output more than doubles.

Put another way, a maintenance job that takes one hour to perform by a dayworker will be done in 24 minutes when a sound incentive is applied. If the base rate of the maintenance worker is, say, $2 per hour, the job will cost $2 on daywork. On incentive the worker will earn a 25% bonus, but the total cost to the company including the bonus will be only $1. Thus the introduction of incentives has the effect of cutting maintenance costs in half while increasing the take-home pay of the maintenance worker by 25%. It's a good deal for both. And it certainly helps eliminate the situation in which a highly skilled maintenance mechanic has less take-home pay than a production worker on a simple, repetitive job—solely because no possibility existed for incentive premiums.

The catch—and it's the one that has held back the application of standards to maintenance work for years—is the high cost of developing standards for the great variety of non-repetitive jobs that make up maintenance work. Job standards set by individual timestudy are out of the question. Such a system requires too high a ratio of timestudy men to maintenance men.

Standard data or time formulas are a better answer. But the time and cost required to compile and apply standard data are still deterrents. True, Methods-Time Measurement (FACTORY, February 1948, and August 1950) helps reduce the time needed to develop standard data. Even then, in most applications one man, armed with standard data, can set reliable standards for only 10 to 15 maintenance workers.

To get away from the high costs of development, attempts have been made repeatedly to develop standards from historical cost data. These attempts have almost always been unsuccessful because of the unreliability of historical records. In some cases the control that this approach has given has proved to be better than no control at all, and some economies have been obtained. But standards based on historical data have not proved satisfactory for incentive wage payment—and that is one of the problems we are trying to solve.

The wrong approach

Actually the answer to the search for practicable standards is simplicity itself: All these years we have been trying to find ways of developing *accurate* standards for maintenance work. We have been following the same approach we use in measuring production, where (because of the repetition involved) the motion pattern and the time required to make each motion are important. We have been trying to set standards that would represent the *exact* time required by the qualified maintenance worker to do each job.

Heres what's wrong with that approach: Accurate measurement is impractical in most cases. It is unrealistic to expect every maintenance worker to do a given job with exactly the same motion pattern in exactly the same time. The varying conditions of the work alone would prevent this. Practical maintenance men for years have asked industrial engineers:

"How can you set a standard that will be fair for, say, a pipe repair job when you can't tell in advance how badly the pipes will be rusted?"

The answer to this obviously is: "You can't." That is, you can't set a standard that will be accurate for each individual job.

In addition to varying conditions, there is another important variable that makes it impractical to strive for accurate individual standards. That's the method used by the worker. In maintenance work, the method cannot be specified motion by motion, as it can be on repetitive work. Instead, to be practical, the determination of the methods must often be delegated to the maintenance man himself.

A new concept

These simple concepts form the basis for a *practical* way to measure maintenance work. They lead to the conclusion that, instead of trying to set individual standards of pinpoint accuracy, it's more practical to set standards based upon the *range of time* in which a given job will *probably* be done by a qualified man. In effect, we can say that a qualified maintenance worker will do a given job in, say, from 40 to 60 minutes, and we can be right perhaps 99 times out of a hundred.

Once we have hold of this simple concept, we have the basis for a workable maintenance work measurement and incentive installation. We call this concept "Universal Maintenance Standards" (UMS). Perhaps at this point, however, we should drop the word simple. Although the concept is simple and is the key to the whole solution, it cannot be applied hurriedly or carelessly if a satisfactory set-up is to result. Application of UMS requires just as sound and careful engineering work as any other installation of standard time data.

Four factors are essential to the success of the UMS plan:

. . . Properly developed standards.
. . . A qualified applicator.
. . . Proper organization of work.
. . . Adequate training of the maintenance force.

The order in which these factors are listed is of no significance. All factors are important. If any one is neglected, the installation is likely to be unsuccessful.

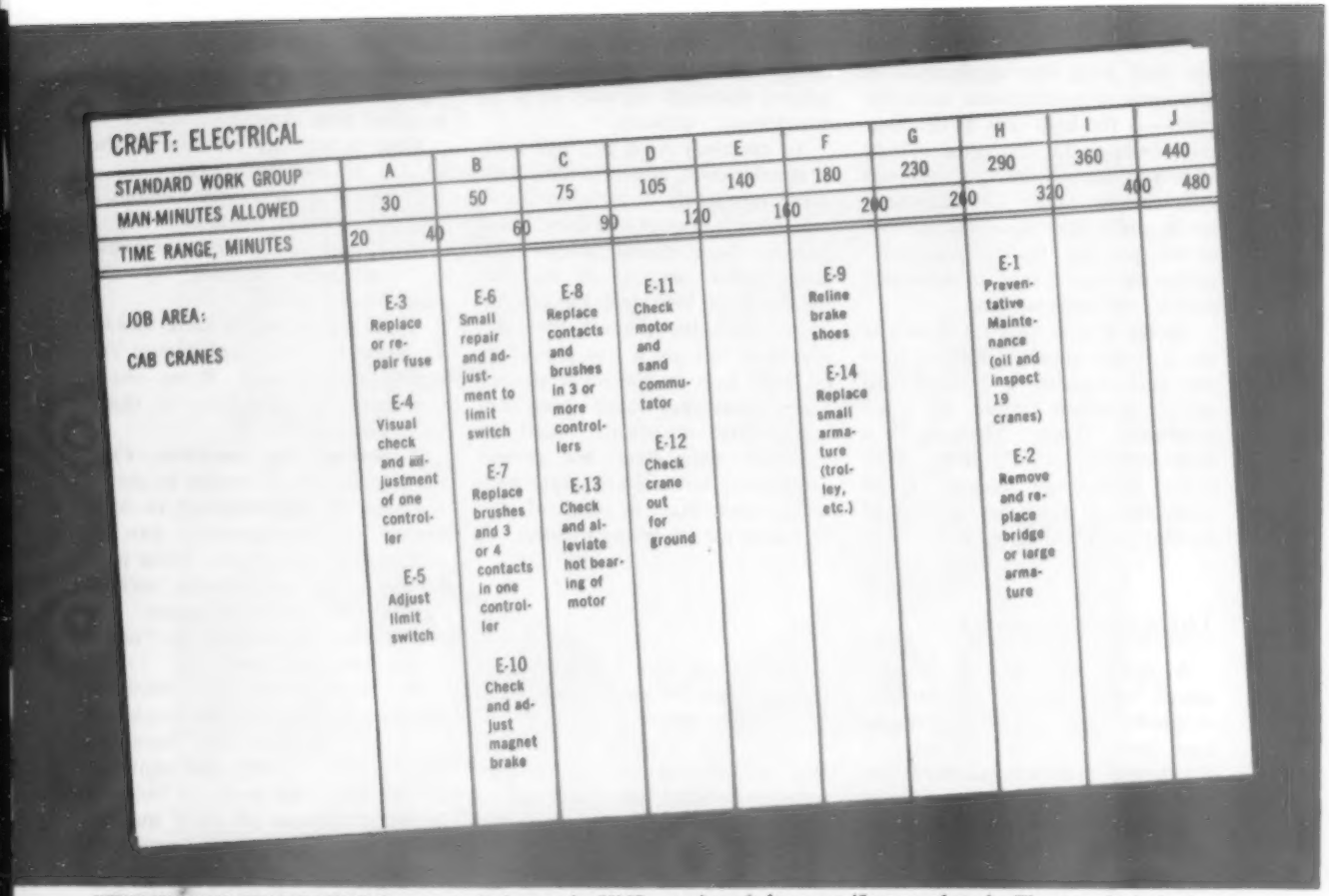
1. Setting the standards—First thing to do is to determine by measurement the time required to do a number of representative jobs in each maintenance craft. These may be jobs taking only minutes, such as "adjust limit switch on crane." Or jobs taking hours, such as "reline brake shoes on crane."

To simplify this task, Methods Engineering Council has developed over 125 standard-time formulas, which after checking and adjusting to existing conditions can be used to set standards on most maintenance jobs. Any unusual work not covered by the formulas can be measured by individual timestudy.

The standards thus developed should represent as nearly as possible the time needed to do the job under the conditions normally encountered, and by the method that the operator of normal or average ability will follow. Admittedly this cannot be done with pinpoint accuracy, but with care it can be done accurately enough for all practical purposes.

Next step is to develop what are called "Standard Work Groups." A number of classes of work are established by time intervals or ranges. Class A might consist of jobs requiring from 20 to 40 minutes to perform, Class B from 40 to 60, and so on. The classes actually established will vary in different installations because of different conditions. The principle, however, is that the intervals should be sufficiently long so that it is not difficult to place a given job in its proper classification, and short enough so that this method of measuring performance is reasonably accurate *over a week's period.*

Definitions and time standards are then developed craft by craft



CRAFT: ELECTRICAL

STANDARD WORK GROUP	A	B	C	D	E	F	G	H	I	J
MAN-MINUTES ALLOWED	30	50	75	105	140	180	230	290	360	440
TIME RANGE, MINUTES	20 40	60	90	120	160	200	260	320	400	480
JOB AREA: CAB CRANES	E-3 Replace or repair fuse E-4 Visual check and adjustment of one controller E-5 Adjust limit switch	E-6 Small repair and adjustment to limit switch E-7 Replace brushes and 3 or 4 contacts in one controller E-10 Check and adjust magnet brake	E-8 Replace contacts and brushes in 3 or more controllers E-13 Check and alleviate hot bearing of motor	E-11 Check motor and sand commutator E-12 Check crane out for ground		E-9 Reline brake shoes E-14 Replace small armature (trolley, etc.)		E-1 Preventative Maintenance (oil and inspect 19 cranes) E-2 Remove and replace bridge or large armature		

BENCHMARK STANDARDS from a typical page in UMS manual show standard work groups and time allowances for each craft for a specific type of work. Time standards for new jobs are obtained by matching their operations with benchmarks.

UNIVERSAL MAINTENANCE STANDARDS . . . *Begins on page 98*

for each classification (or standard work group). The definitions describe in general terms the kind of work that belongs in each classification. For example, the definition of Group F jobs in the electrical craft as prepared for one company reads as follows:

"Trouble-shooting jobs that require considerable checking and analysis are included in Group F. Connecting and disconnecting medium-sized equipment, like welders, and moving the equipment to the repair shop, fall in this category. Painting, cleaning, and checking a motor between 7½ and 14 horsepower is a typical example. A group F job can also be made up of combinations of smaller jobs."

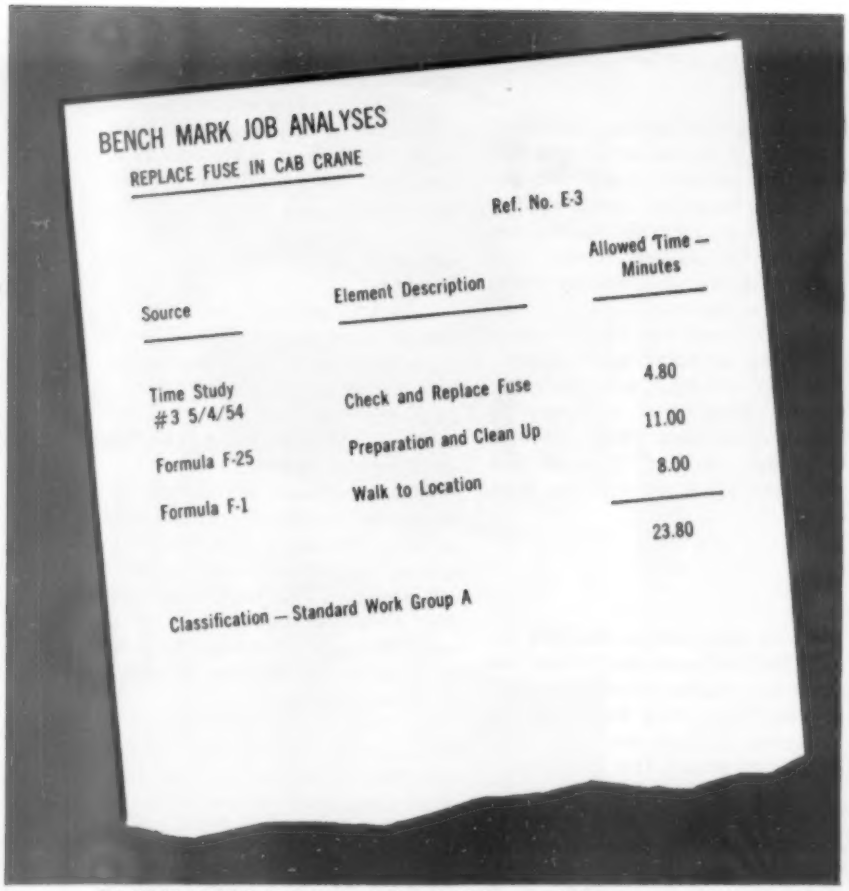
Establishing the time for each classification requires a little more work. Let's assume Group F covers a range of time from 160 to 200 minutes. The question is: Should the time allowed for Group F jobs be established at the mid-point (180 minutes)? Or should it be greater or less? This value is determined by deriving an average of the measured times of a representative sampling of Group F jobs. And similarly for all other groups.

Final step is to develop a manual of "Universal Maintenance Standards" for each craft. This becomes a fairly thick volume which shows on the first two or three pages the groups and their definitions, and the single time standard for each group. Then it presents in some detail the information an applicator will need to classify properly any maintenance job in the craft.

These details are set up in tables similar to the one shown above. They show typical jobs within each group. And serve as benchmarks to which the applicator compares each future job. He does this in much the same way that elements of a new job are compared in job evaluation, until the job is finally "slotted" between two previously established jobs in a ranking list.

Backing up each job shown on the tables is more detailed information showing the elements of the job, the time required for each job, and where the time came from. The exhibit on p. 101 shows the back-up information for the job, "Replace Fuse in Cab Crane." Finally the time formulas themselves (not shown) from which many of the element times were derived are made available for reference. Since these are MTM formulas, the applicator can, if he wishes, check back and see the exact motion pattern on which a given time value was based. Our experience has been that about two man-months of engineering time will be needed to set the "benchmark" standards for each craft.

2. Applying the standards—Perhaps by now our reason for stating that a qualified applicator is neces-



BENCH MARK JOB ANALYSES

REPLACE FUSE IN CAB CRANE

Ref. No. E-3

Source	Element Description	Allowed Time — Minutes
Time Study #3 5/4/54	Check and Replace Fuse	4.80
Formula F-25	Preparation and Clean Up	11.00
Formula F-1	Walk to Location	8.00
		23.80

Classification — Standard Work Group A

BACK-UP DATA in separate section of UMS manual show sources of time standards and how they are calculated for each benchmark operation. They make a useful reference for gaging and slotting either normal or unusual jobs.

sary for the success of the installation is apparent. The applicator must understand both the data he is working with and the maintenance work on which he is setting standards. He must be in effect a practical maintenance man himself, able to visualize how any job within the crafts he handles will be done.

Here's how he sets a standard: When he is notified of a new maintenace job to be done, he first familiarizes himself with exactly what is required. For a simple routine job, such as replacing a fuse, the requisition or work order may give him all the information he needs. On slightly more complicated work, he may find it necessary to call the man who originated the requisition to get the details of what is involved. If the job is still more complicated, he may have to visit the work location, talk things over with various people, and size up the job personally before he can be sure he knows exactly what is required.

Once the applicator knows what is involved, his work is practically done. After some experience he can classify most jobs properly without reference to the manual. The time it takes for him to set the standard is then only the time it takes to record the classification and the standard. For a few jobs he will need to consult the manual and perhaps make some new computations. But in any case, the standards-setting process is quick, sure, and as accurate as the variable nature of the work justifies.

3. Organizing the work—Successful application is greatly aided by proper organization of work. This includes planning, scheduling and dispatching, paperwork routines, and the design of the incentive plan itself. When the work has been properly organized, we have found that one applicator can handle from 20 to 30 maintenance men on incentive (the equivalent of 40 to 60 daywork maintenance workers).

On work as varied as maintenance work, checking performance on an individual job basis is costly and often impractical. If all hours earned on jobs worked on during a pay period, however, are checked against hours worked, a measurement of performance is obtained that is sufficiently accurate for wage payment purposes. This is true of either individuals or groups. Whether the individual basis or the group system is used, will depend upon conditions at a given installation.

It might seem that the use of the "range" concept would make the standard for any given job so inaccurate that there would not be much relationship between hours worked and hours earned. Actually, however, the percentage of maximum deviation between a group standard and the minimum and maximum time covered by the group is not great, particularly on jobs over 90 minutes in length. To demonstrate this point, refer back to the values of the time ranges for groups A to J (page 100). Then note the single allowed time value. (In this case, to simplify explanation, this value — which is the average of a representative sampling for each group—has been arbitrarily established at midpoint.)

From these values you can see the maximum deviation for jobs over 90 minutes is 14.3% or lower. But in practice it's usually less because the standard for each group is more accurately fixed by the average of its representative jobs. Thus the deviation between any group standard and the measured standard time for most jobs will be small—smaller than the variations introduced by differences in working conditions and working methods. Further, one plus deviation will serve to balance out another minus one, so that in a period of time, say one week, the effect of any wide deviations is not significant.

4. Training the worker—An important principle of management is "If you delegate, you must educate." Since the determination of work method is left largely to the worker, training is necessary to make sure he follows a reasonably good method. Also it's important for each maintenance worker to understand the work measurement plan and appreciate the correctness of the concepts on which it's based.

That this is particularly important in maintenance work, was dem-

onstrated by a recent experience. A large chemical company decided that its pipefitters were in need of refresher or tune-up training to increase their effectiveness.

However, there were too many pipefitters to be trained in a single program. So the group was divided into two, and one group was put through a well-designed program. Before the second group was trained, an analysis was made of the work done by both groups. For this purpose, the work was classified as "productive work" and "lost time." Productive work was considered to be anything that definitely advanced a job to a successful conclusion. Lost time included things like going after forgotten tools, making false starts on methods that did not produce the desired results, and trying to do the work unsuccessfully with the wrong tools.

It was found that the untrained group was spending approximately 20% on lost-time activities. The trained group had a negligible amount of lost time. Thus it was able to produce about 25% more than the untrained group with the same effort.

What the tests show

From what we have seen of UMS approach in test applications, no management need any longer neglect to plan for the increased effectiveness of its maintenance force. Although it takes a little time and a high order of competence to set up the initial installation, the day-to-day application is simplicity itself.

As a means of getting a comparison, we had an applicator set standards on a number of maintenance jobs with UMS. At the same time we had an experienced industrial engineer establish standards on the same jobs by a combination of standard data, MTM, and timestudy. The applicator arrived at a UMS standard in from one to three minutes. The industrial engineer with all his data required an average of 25 minutes for each standard! Furthermore, in every case the applicator was able to slot the job into the correct standard work grouping (as determined by the detailed analysis).

In a more complete test run at a well-known plant cooperating with us on the development of the UMS approach, during an 18-day period 946 maintenance work orders were processed. Of this number, the applicators were able to rate 898 orders. Only 48 work orders were not rated, for a variety of reasons including insufficient data, being tied up in meetings when the jobs came along, and so on. The 95% coverage indicated by these figures is something hitherto unheard of in maintenance work measurement. In terms of hours, coverage was only slightly lower—almost 92% of all hours worked by the maintenance crew during the test period.

One reason for the high coverage was the discovery during the test that most jobs of more than eight hours could be broken down into groups of less than eight hours, and the standard set by summing the times for the groups.

We recognize that there's still much to be done to perfect the UMS approach and to make it even more simple and more universally applicable than it now is. But we feel we have gone far enough with our initial applications to be able to state some preliminary conclusions.

. . . *UMS eliminates detailed studies* for most maintenance work and makes the establishing of standards and the administration of incentives even simpler than in the case of repetitive production work.

. . . *Earnings of maintenance workers can be increased* to the point where they'll bear a rational relationship to the earnings of production workers.

. . . *Maintenance costs can be halved* in an atmosphere of high morale.

. . . *UMS provides for the first time an economical means of measuring maintenance work and putting it on incentive* for the small and medium-size company, and for the larger company having a relatively small maintenance staff.

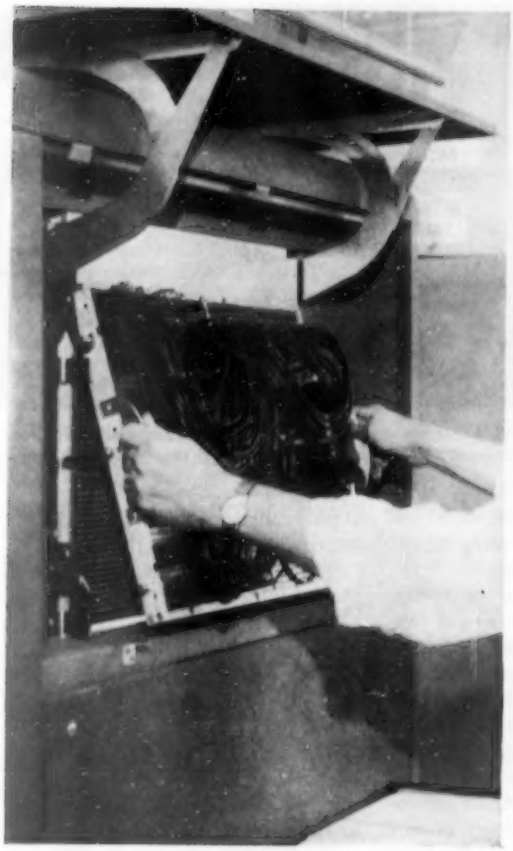
With automation increasingly upon us the number of maintenance workers will grow (at least, the *amount* of maintenance required will increase). Thus the management that wishes to maintain a strong competitive position must broaden its plans for the improved efficiency of its maintenance force.

We believe that UMS will be of very marked value in this connection. Not only will it permit progressive management to get better results, with lower costs, from its present maintenance group, but it will pave the way for high efficiency as the maintenance force grows with the advance of automation.

AUTHOR'S NOTE:

We recognize that, for a variety of reasons, some companies may not wish to introduce incentives on maintenance work. In that situation, a substantial improvement can be gained by using UMS even without the application of incentives. We feel we should point out, however, that this would not solve the problem of the disparity of the earnings of the skilled maintenance worker on daywork and the comparatively unskilled production worker on incentive. Until such sources of irritation are eliminated, we cannot expect to have as good human relations within industry as we would wish.

BEFORE, NOT AFTER, is the key to planning your new plant for efficient, low-cost handling. Don't let your architect go too far before checking the ten structural details that spell the difference between success and failure . . . ***a December article.***



PROGRAM is quickly altered to make way for a new problem. Just plug in these easily wired panels.

JUNIOR-SIZE Univac does man-size job. Processes 150 punched cards a minute, makes all calculations for scheduling production.

Scheduling by Computer

Good news for smaller concerns! You, too, can now afford to hire an electronic computer. Read all about this plant's success with a small machine that does a big job.

THIS SMALL electronic computer is scheduling starting dates for almost 12,000 manufacturing operations a month. In just eight hours. With just three operators. And we (at Axelson Manufacturing Company, Los Angeles) are getting information we never had before. The computer gives us a complete breakdown by operations. It tells us when each step—each operation in the manufacture of each component—should be started, when it should be completed.

The change-over from manual methods was made about four years ago. Here's what it has meant:

. . . *For production control,* reduced clerical labor, better control of work in process.

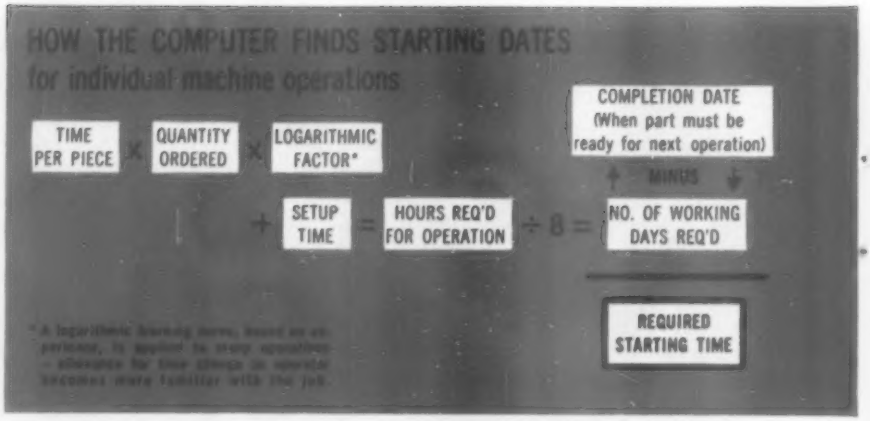
. . . *For the shop,* improved efficiency, better utilization of machine time, and fewer late orders.

. . . *For the company,* smaller in-process inventories and lower manufacturing costs. Axelson builds heavy-duty precision machine tools, oil-pumping equipment, and aircraft components. If the computer eliminates a late delivery on one lathe and prevents a cancellation, we save several thousand dollars.

No "giant brain"—This machine is nowhere near as big and complex as the huge Univac machines you hear so much about. It's a Univac "60" (formerly called 409-2R), which is a punched-card electronic computer made by Remington Rand. Costs us about $700 a month to rent. It has many features of the larger computers—at a price a shop like ours can afford. Prime advantages not found in conventional tabulating equipment are these. It . . .

. . . *Handles complex computa-*

By WILLIAM G. BECKMAN, Manager Tabulating Department, Axelson Manufacturing Company, Division of U.S. Industries, Inc., Los Angeles



COMPLETELY AUTOMATIC, computer works back from date any given part must be complete, subtracting production time needed for part to get required starting date.

tions at high speeds. A programing board (see photo, p. 103) is set up to direct the machine through its operations.

. . . Checks its own work. For example, suppose the machine multiplies *A* times *B* to equal *C*. As part of this same programing step it will automatically divide the resulting *C* by *B*. And then subtract *A* to make sure the difference is zero. If not, there is an error in the computation and the machine detects it, stops, and signals to the operator.

. . . Stores information—for any desired length of time. And stored information can be altered and restored as the machine proceeds through its operations.

. . . Performs in one pass operations that would take several passes through conventional tabulating equipment. Answers can be punched into the same cards containing original information—as they are processed at rates up to 150 per minute.

. . . Reduces clerical help and machine rental. Remington Rand officials estimate that it would require about three times the rental cost and four times the clerical help to do the same job described here with conventional equipment.

As already stated, this scheduling job takes 8 hours per month. This doesn't mean the computer is idle the rest of the time. Other jobs it does: inventory control, 9½ hours; labor cost control, 67 hours; cost control summary, 7 hours; payroll, 19½ hours; accounting, 8 hours. Total time in use, 119 hours per month.

Job-shop scheduling—Our products are made from many component parts. Schedules for all parts must dovetail together to meet delivery dates. This is a problem we share with all other job-shop operations.

The number of separate operations that must be performed on each part varies from five to 85. Total flow time for one order may run from a few days to six months. About 4000 complete manufacturing orders must be closed every month. So our job in the tabulating department is to compute when to schedule each operation so it will be ready for the succeeding one—all the way down the line.

To do this scheduling operation, the computer must turn out approximately 500 punched cards representing scheduled operations each day. Six additional copies are reproduced from each of these—for a total of 3500 cards a day. (Two sets of three identical copies are used in the control system described later—one set forwarded to each of our main plants. Cards for parts made in one plant are destroyed by the other on receipt.)

How schedules are made

The basic source of information for our production scheduling is a master file of punched cards. Every component part that our two plants and foundry produce is represented. And each part has a deck of master cards, one for each operation performed—whether 5 or 85. Each master card contains the following information about the production unit it controls:

. . . Operation number—code for type of work, machine it's done on.

. . . Number of department responsible for operation.

. . . Number of the machine-center group doing this work.

. . . Sequence and control number to indicate serial sequence within makeup of the part—like 1 of 5, 2 of 5, etc.

. . . Machine running time for operation. This is an average, constantly adjusted with performance, improved tooling, methods, etc.

. . . Set-up time required to tool the machine.

Master decks are filed serially, according to part number. When an order is received from production control, proper decks are removed (by hand) and reproduced. These cards form the basis of the working deck. Into each is repeat-punched the following information applying to the current production order:

. . . Work order number.

. . . Number of pieces called for in the order.

. . . Scheduled completion date for the entire job.

This working deck is then ready for processing by the computer.

Computer processing—Cards are arranged in reverse order so the computer processes the last step in the manufacturing sequence first. And completion dates are carried back—for computing when earlier operations must be scheduled. In this way the computer specifies completion dates for each operation on each component part in order to conform to the final delivery schedule. As it processes the working deck, several computations are made for each card—almost instantly—and the answer is punched into it.

The diagram (above) spells out this computation: Machine time is multiplied by number of pieces ordered. Set-up time is added to this figure to obtain total hours for the operation. These hours are then divided by 8 to reduce the figure to working days. Then the working days are subtracted from the required completion date (coded ac-

cording to the working-day number of the year.) This working-day code is later converted to actual day and month, when the punched information is interpreted and printed on the cards.

For many of our operations, particularly the manufacture of lathe parts, the computer performs a special and exacting calculation. It applies a logarithmic formula that allows for increases in productivity with learning. For example, in making 100 identical pieces, the last part will often take 20% less time than the first. All our machine times are based on lots of 50 pieces. Fewer pieces take more time; more pieces take less. From the formula constants plug-wired into the computer, the machine automatically applies an increasing percentage, based on the quantity 50.

When the working hours are divided by 8, any remainder from 0.1 hour to 7.9 hours is rounded out to add one more day. This gives us an average of 4 hours' leeway, which turns out to be about the average flow time between manufacturing operations.

When the computer comes to cards that represent non-machine operations (or hand operations like deburring, cleaning up, etc.) it handles them in a different way. Hand operations are calculated as a flat 4 hours—an average based on experience. Outside operations (like plating) are calculated as a flat 3 days (or 24 hours), a conservative allowance.

With this single run through the computer we develop complete production scheduling figures. Our next step is to reproduce two sets of three other identical working decks. This is done on a conventional punched-card reproducer. The entire computer and tabulating job requires three operators.

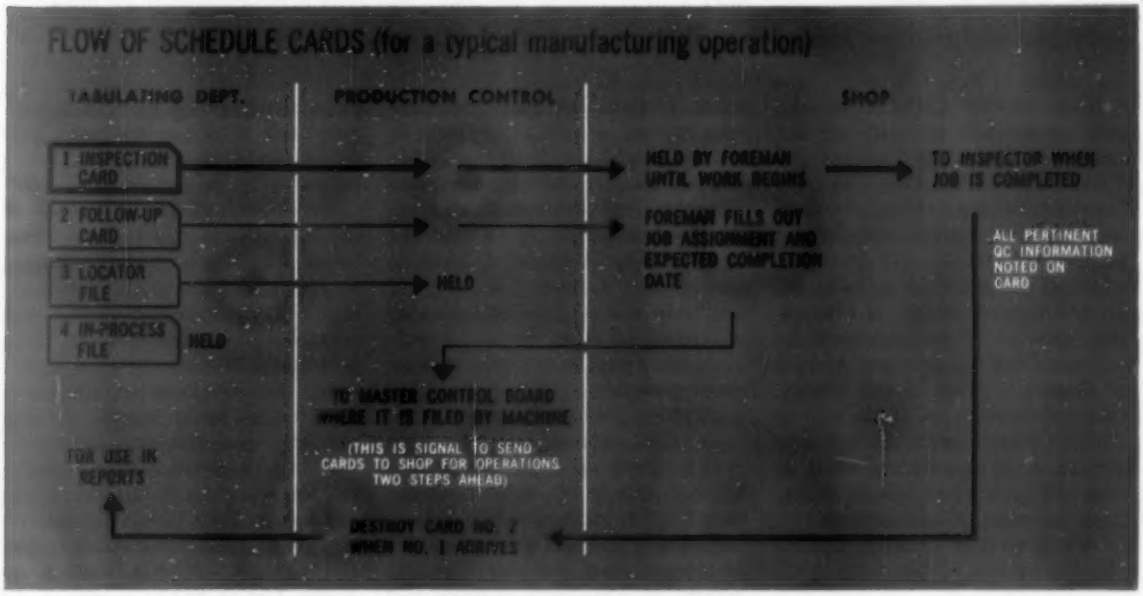
Control system—The flow diagram (below) shows the simple punched-card control system made possible by using a computer to schedule operations. When production control receives a deck of cards covering a pending order, both the follow-up and inspection for the first two steps of manufacture are sent to the appropriate foremen in the shop.

Each foreman has his own control board with specific spaces for current loadings on every one of his machines. Production control specifies loading by machine center. Foremen select the particular machine, according to experience with machines, operators, and jobs. Both cards are kept until work actually begins on the order. Then the foreman notes the job assignment, specific machine it's being performed on, and expected completion date on the follow-up card—and sends it back to production control. The inspection card, with duplicate notation, is inserted into the appropriate space in the foreman's board.

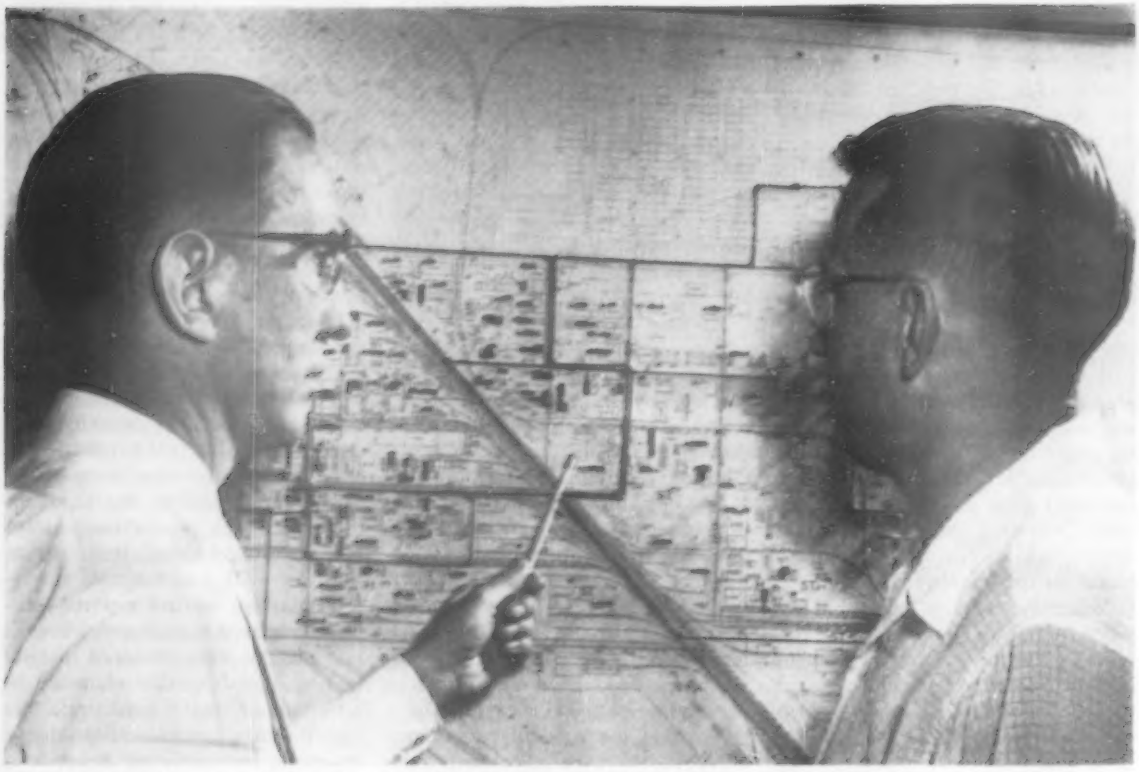
When the follow-up card is received in production control, it serves as a signal that the operation is actually in process. So production control can now send follow-up and inspection cards covering the third manufacturing step to the foreman responsible. The follow-up cards returned to production control go into a master control board, arranged by machine groups. This gives production control finger-tip reference to the exact status of every piece of work on our factory floor.

The procedure of working two steps ahead of actual production is repeated until the completion of the order. And handling the cards in this way gives production control repeated checks on the current status of work schedules.

Production control reports—Reports prepared from inspection-card information have reduced capital tied up in salvageable materials to a fraction of what it used to be. We also produce, once each quarter—or more frequently as needed—a full machine work-load report for each of our plants. These reports give management a factual, vivid picture of how work on hand compares with available machine time. With this information our production specialists know the amount of machine time they will have to buy from outside concerns.


FLOW OF SCHEDULE CARDS (for a typical manufacturing operation)
TABULATING DEPT.
PRODUCTION CONTROL
SHOP
1 INSPECTION CARD
2 FOLLOW-UP CARD
3 LOCATOR FILE
4 IN-PROCESS FILE
HELD
HELD
HELD BY FOREMAN UNTIL WORK BEGINS
TO INSPECTOR WHEN JOB IS COMPLETED
FOREMAN FILLS OUT JOB ASSIGNMENT AND EXPECTED COMPLETION DATE
ALL PERTINENT QC INFORMATION NOTED ON CARD
TO MASTER CONTROL BOARD WHERE IT IS FILED BY MACHINE
(THIS IS SIGNAL TO SEND CARDS TO SHOP FOR OPERATIONS TWO STEPS AHEAD)
FOR USE IN REPORTS
DESTROY CARD NO. 2 WHEN NO. 1 ARRIVES

MAJOR FLOW of information takes place on inspection card (heavy arrow). Production control forwards card to the shop. When work is complete, it goes to inspector who fills in quality control data. Card then returns to production control.



WALL CHART is a zone-and-section map that tells the what and where of instrument maintenance. Boundaries are in colors. Colored pins show number of instruments in sections. This way, responsibility is clear and workload can be appraised.

More for Your Instrument Dollar

Dow gets it with better maintenance. You can, too, with this four-point plan and these eight smart ideas. They'll pay off for any plant—big or not so big.

FOR A GOOD CHECK on the facts, always ask the man on the firing line. That's just what I did when I went to The Dow Chemical Company, Midland, Mich., to look over its instrument maintenance program.

First I got a lot of valuable information from Rollin H. Briggs, superintendent of the instrument department, and his assistant Marion L. Bandeen. Also from George Rock, instrument engineer.

Then Briggs called in his field foremen separately—three of them—for any questions I wanted to ask. I put just one question to each:

"What, in your opinion, are the prime factors that give you low-cost, as well as efficient instrument maintenance?"

Their answers shouldn't have surprised me, but they did. Each foreman unhesitatingly gave me the same opinion. It added up to these four primary factors:

. . . Careful selection and training of instrument men.

. . . A good preventive maintenance program.

. . . Plenty of spare parts.

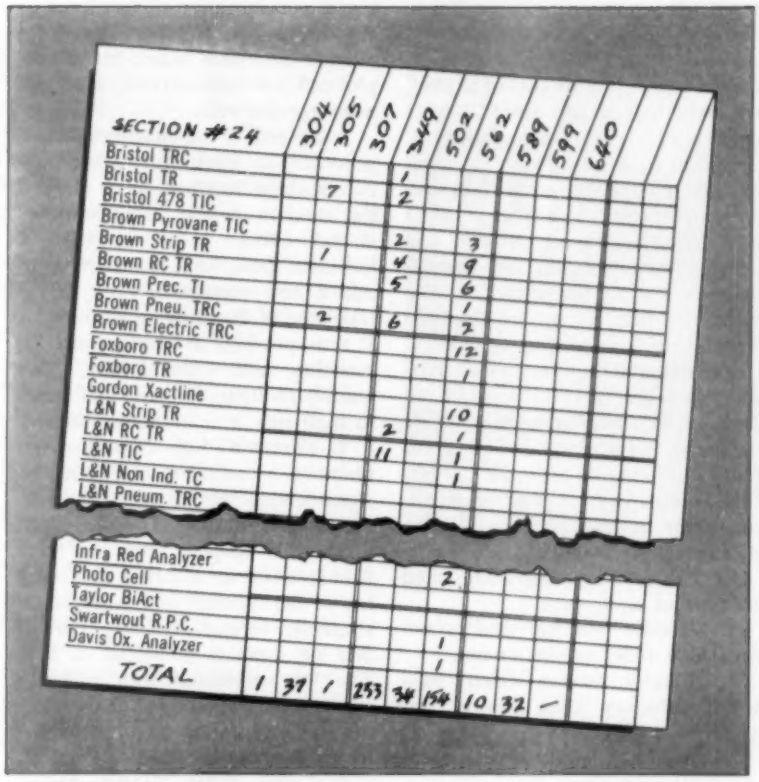
. . . Plenty of technical data.

Instrument maintenance at Dow Midland is big business. Dow has over 12,000 instruments to control processes for some 600 products. New installations run about 250 per month. Trouble calls average 600 per month. There are 63 hourly employees, supervised by 3 field foremen and 1 shop foreman. Two clerks complete the head office corps.

Instruments at Dow are classified as mechanical (including pneumatic) and electrical (including electronic and thermal). Name any type—gaging, recording, indicating, controlling, metering—I'm sure Dow has it. Besides the usual equipment for temperature, pressure, flow, liquid level, specific gravity, viscosity, and the like, Dow's instrument department also handles communications, mobile radio, pH and conductivity, process alarm systems. Plus gas analyzers for hydrogen, oxygen, chlorine, carbon dioxide. And so on.

Any one of Dow's journeymen

By CARL G. WYDER
Maintenance Editor, FACTORY



FOREMAN'S LOG tells him how many and what kind of instruments are in his zone. He keeps log updated, supplements it with small reproduction of the wall chart.

instrument maintenance men can service this wide variety—some 80 types in all. Credit this ability largely to training. But even beyond that lies Dow's firm belief, when it first organized the department in 1930, that instrument men don't first have to be good tradesmen. They need other attributes as well.

And this brings me back to a quick look at the four pillars of Dow's maintenance program:

Selection and training—It takes 2½ years of Dow training—classroom, shop, and field work—to qualify as an instrument journeyman. A trainee begins as instrument helper for 12 months, moves on to senior instrument helper Class 1, Class 2, Class 3, each succeeding 6 months. A written examination precedes each promotion. After meeting requirements for journeyman, a senior instrument helper Class 3 is placed in a pool to await the need for such a worker.

To qualify as an instrument helper, a man must:

. . . *Have a high-school education* —or equivalent—with high-school algebra, physics, and/or chemistry.

. . . *Maintain physical health;* meet a color and vision test.

. . . *Pass an aptitude test* with a grade of 75% or better.

. . . *Pass a Wonderlic test* (for learning ability) with a score of 25 or better.

. . . *Give evidence of normal personality (shown by tests).*

. . . *Have high mechanical interest*—with above-average scientific interests and average computational interests on the Kuder preference test (for vocational aptitude). And show natural ability for instrument work.

Journeymen can reach the top post of instrument technician—as Dow needs them—by satisfying some stiff requirements for the more complex operations. At present Dow has about one technician to every four journeymen—and to a slightly higher total of instrument helpers in all the grades.

The training course Dow follows is similar to "Industrial Instrument Course Outline" sponsored by the Instrument Society of America. (You can get a copy for $1.50 from ISA, 1319 Allegheny Ave., Pittsburgh.) Briggs served on a committee for preparing the ISA course.

But initial training isn't all of it—not by a good deal. Men at Dow get continual training by refresher courses. And they're taught about the workings of every new instrument Dow buys and installs.

Another way to broaden a helper's education: Dow rotates him at least once a year as helper to a new journeyman. The company also gets him accustomed to the changes and the new activities that typify Dow operations. Dow doesn't want its men to work down into a rut where they'll resist change.

Preventive maintenance — About 70% of Dow's instrument maintenance is preventive. Repairs and installations make up the rest.

Dow has three field crews that work under three field foremen and one shop crew under the shop foreman. With operations growing, there'll be need for a fourth field crew soon. Field crews are subdivided to serve geographical sections. And in each section specific men handle either installation (new construction) or maintenance. This separation keeps preventive maintenance from being subordinated to new work.

Field men on maintenance assignments charge their time to standing orders. Each crew has a headquarters area—a room or workbench with test equipment, and a locker for spare parts. This equipment is centrally located. All cabinets are locked with a master key control.

Ordinarily each crew has a definite tour to make once or twice each day. It inspects instruments, adjusts minor defects, checks with operating personnel to insure that all is well. The remainder of the day is spent at trouble points. These are places that need attention beyond mere adjustments.

If a repairman uncovers any serious trouble, such as down-to-zero-readings, he stays with it until it's repaired. The rule is that production must go on. If trouble develops at any other time, the production people telephone a central-office dispatcher—one of the clerks. Field men check hourly with the dispatcher for such calls.

Turn the page

Instruments that need extensive repairs, changes, or recalibration are brought into the instrument shop by the field maintenance men. Here facilities are provided for repair and recalibration of any of the instruments in field use, including all types of electrical meters, temperature, flow, pressure, and electronic devices.

The instrument shop employs a watchmaker. He keeps all timing devices in proper operating condition. Shop also designs and assembles special instruments for laboratories or production plants. In short, an efficient instrument repair shop is a "must," says Briggs, to supplement good field maintenance.

Spare parts—Dow operates a central parts stockroom adjacent to the instrument shop. No ordinary stock clerk or parts man can run it efficiently, says Briggs. It takes a well-qualified man who knows his instruments. Plus adequate space and good cataloging.

Dow relies on a numerical coding system and on mechanical tabulating equipment for inventory control. Once a year it tabulates the inventory, showing number of items used or not used. Coding system is tied in with vendor parts numbers.

What parts to stock? This is decided by the men who supervise instruments. They realize the need for certain "insurance" items. Some special items, one or two of a kind, are only tagged and stored—don't enter into inventory calculations.

A field man can always get parts quickly. He phones in his requirements, identifies them from catalogs he usually has in his cabinet. The storekeeper attaches a red special-delivery tag to the material. The order is speeded to the location by a fast-moving pick-up service.

Technical data—In Dow's central office are files that contain all sorts of information helpful to instrument maintenance. The company maintains an open-door policy that permits any foreman or instrument man to draw on these files for details. Here's what's available:

. . . *Catalogs and literature,* filed by type of equipment.

. . . *Vendor tracings and drawings,* filed under vendor's name.

. . . *Vendor service sheets,* paid for if necessary when they are revised or updated.

. . . *Bound volumes* of several instrument magazines.

. . . *Purchase orders,* filed by vendor and by year.

. . . *Original flow calculations.*

. . . *Dow blueprints and instructions,* filed by Dow building number.

The office keeps a cross-reference card index of catalogs. Dow insists on three sets of instructions and equipment prints with each purchase order.

Eight ideas for better maintenance

As I might have expected, Dow Midland has developed some ideas and practices that have contributed greatly to a smooth-working instrument maintenance program. Here are some tricks that any plant, large or small, can adapt to its own uses:

1. Work-load chart—A portion of this chart is shown at the start of this article (p. 106). The chart itself—about 3½ x 5½ feet—hangs on one wall of Briggs's office. It's a geographical layout of the Midland plant. The plant is divided into three large zones. Each zone has several sections. Zones are numbered 20, 30, and 40. Sections within Zone 20 are numbered 21-27; Zone 30, Sections 31-36; and Zone 40, Sections 41-45. Dow marks the zone boundaries by colors—red, green, and yellow.

The chart is also dotted with colored round-head pins. These show number and distribution—but not kinds—of instruments in the plant. For example, a tan pin indicates 100 instruments; maroon, 25; yellow, 10; green, 5; blue, 1.

This chart helps appraise and balance the workload. Each zone represents the workload of one field foreman. Crews are identified by number. For instance, Crew 1 is the shop crew; Crew 27 works in Zone 2, Section 27. Aim is to have one man handling 500 to 600 instruments. That's why some sections are smaller in area than others. One of the factors that determine section size is concentration of instruments. Another is type of production operations—corrosive areas, for example, call for more service, send out more trouble calls.

Every month the chart is updated according to work orders on which construction foremen have marked the number of new instruments installed. (When I saw the chart it indicated Dow soon would have to add a new section in Zone 20 to take care of the growing workload.) It thus provides a factual basis for rezoning and resectioning, and quickly reorients foremen and crews to their new area responsibilities.

2. Foreman's log—Dow does not maintain a central record of all instruments. Briggs says it would be too time-consuming. The wall chart serves this purpose. But the three field foremen do maintain a running log of the number and types of instruments in each building. Part of one log sheet is shown on p. 107. The log, combined with a letter-size reproduction of the chart, summarizes everything a foreman has to know about his zone.

3. Extra shifts — Dow doesn't have any at present. Instead, it calls men in for emergencies. But because preventive maintenance is good, there are few calls. Over weekends one man is assigned to cover the entire plant.

Dow keeps a call-in list for the plant protection staff when necessary. Usually any journeyman can handle a breakdown. But if he can't, he knows he won't be censured if he calls on a foreman for help.

4. Defective parts—Dow's rule: Return them. Sometimes the shop can repair the part economically. Other times it's cheaper to throw it away than to repair it.

The shop makes the decision. Is the part critical? Plenty of them in stock? What are the economics of material and labor vs. cost of new equipment? One thing Dow has learned: A waiting instrument man is cheaper than downtime. He can always stay busy on gage repairs.

And while I'm on the subject of repairs, Dow likes to have its field men certify the need for repairs. Sometimes, for instance, production men call for repairs where the process or some other condition—such as barometric reading—is to blame. That's why all shop orders clear over the superintendent's desk.

5. Salvage area—Dow now sends all badly damaged or obsolete instruments to a "hold-for-parts" area. This often speeds repairs on other instruments. And it's not necessary to keep on stocking parts, once they're exhausted, for old equipment or for equipment disqualified by high repair costs.

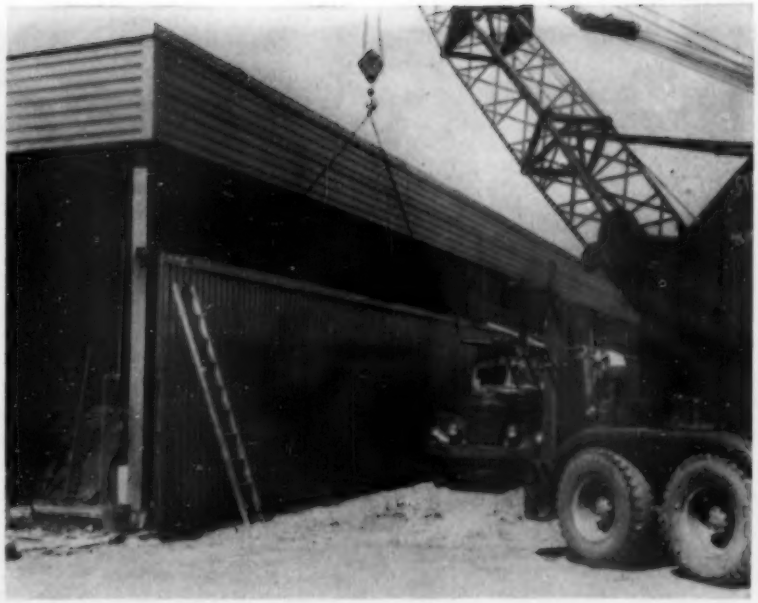
6. Regular meetings—The engineering department prepares specifications for new instruments. One way to keep engineers informed about results is a monthly meeting with instrument maintenance supervisors. It's a realistic way to find out what's good or bad about a product. The two departments compare notes, set up better standards.

In a set of weekly meetings Briggs and his supervisors discuss their maintenance problems. They review the workload, delve into circulars, ads, and other sources of information about new instruments.

7. New items—There's a glass display cabinet in the hallway leading to Dow's central office. Can't miss seeing it as you come in or out. Dow exhibits all new items and parts in this cabinet. Parts are described on a small showcard. The display acquaints men with what's available. They often find the answer to one of their problems here.

This education in what's new is continued at regular monthly safety meetings of foremen with men. They discuss new equipment, new procedures, as well as safety.

8. Checksheets—Every journeyman carries a loose-leaf, pocket-size "Maintenance Route Book." In it he assembles checksheets for his important instruments. Dow controls about 3000 instruments with this system. The checksheets tell what to do to instruments—and when. Dates, of course, differ for various exposures and applications. It takes about a year to set up a dependable schedule for a new installation. No question, says Briggs, this paperwork pays. Instrument men have to do less work. And there's less downtime. The books are turned in monthly to foremen, then to the office, for a data review. The record gives a foreman a quick summary of what a repairman has done, cuts down the foreman's work without lessening his effectiveness. It also shows what instruments are giving trouble, makes it possible for foreman to suggest improvements.



ALUMINUM SIDING swings into place quickly for plant addition.

Growing the Easy, Low-Cost Way

Your plant busting out at the seams? Here's how you can stretch it fast. And save some money, too.

A CLEAR SAVING of $11,520. That's proof positive that American Sterilizer Company was on the right track when it re-used aluminum siding for a 132,000-sq.-ft. addition, rather than conventional block and masonry.

Here's the story—and the details of how the company stretched its construction dollars:

A year or so ago, when American Sterilizer built a new plant in Millcreek Township, Erie, Pa., contractors estimated masonry would cost a lot more than aluminum siding. And that at least some of the masonry would be a 100% loss when time came for expansion.

So the first unit at Millcreek—100,000 square feet—was sheathed with aluminum, plus 1 inch of glass fiber backed up by 18-gage steel. It housed 22,000 square feet of foundry space and 76,000 square feet for machine shop, sheetmetal shop, laboratory. At that time, the company thought that would be enough space for the next five years.

But the economies of one-plant, single-floor operation pushed us faster than expected. So in February, 1955, we decided to add 132,000 square feet of new plant space and 26,000 square feet of office space.

Savings nailed down — Contractors had estimated the original masonry walls at $1.94 per square foot ($1.44 for brickwork, $.50 for concrete block backing). Every square foot knocked down for the addition would be just that much lost. And new masonry for the addition would cost $1.94. The total cost of masonry, therefore, would be $3.88 for every square foot replaced.

On the other hand, original aluminum siding (40-ft. sections) cost $1.73 per square foot. And it would cost $.35 per square foot to move the original siding, attach it to new columns. Total: $2.08. Difference between aluminum siding and masonry: $1.80. The company reused 6400 square feet of aluminum siding for the addition. Total saving ($1.80 x 6400): $11,520.

HOT SPRAY AND BETTER LIGHTING add up to better finishes. Heat replaces thinner. More paint goes on, stays on. And lighting, now three times as good as it used to be, will be still further improved in new booths now being built.

Three Ways to Painting Payoff

Heat subs for thinner in new spray process. New lighting triples visibility. Better handling protects finishes. It all pays off in faster work, big savings.

REPAINTING? A thing of the past. Customers' squawks few and far between. And a big payoff in man-hours saved — a daily 15 on one job, 4½ somewhere else, and one man handling the jobs of five.

Credit this happy turn of events at Beech Aircraft's Wichita Plant II to three major changes in painting and assembly methods. All are the results of studies made by Plant Manager John Allen, Paint Foreman Witt Wagner, together with their assistants.

1. Hot spray—Beechcraft "Bonanzas" now get their paint hot from Spee-Flo heating units. Before Beech changed over, the paint was sprayed on cold. No one could say mirror-like finishes didn't come off the line. They did. But they were achieved at the price of extra man-hours and materials.

There's nothing complicated about the process Beech now uses. Only real differences are:

. . . Paint goes through heating unit before it reaches spray gun.

. . . No thinner is used. The heating unit gets the paint up to around 160 F. right away, but temperature drops again to about 80 F. as paint sprays through the air.

This rapid cooling is all to the good, however. Most of the solvents evaporate before they reach the surface being painted. Result: More paint goes on and stays on. Solids dry quicker, give a thick, tough, long-lasting paint job. And no runs or snags. Fast drying pays in more ways than one. Dust doesn't have time to pile up on surfaces. Finishes have a high natural gloss right away.

With heat substituted for thinner, uniform viscosity is the result. Even if there are changes in temperature and humidity, the heat-spray process still gives an even surface. Here's where that 15 man-hour saving comes in. Waxing, dusting, and polishing have been eliminated.

The company figures its savings on fuselage and wing painting alone

BETTER HANDLING teaches workers painted surfaces don't have to get scratched. Here a new wing-trim jig permits fitting of wing to fuselage without a scratch.

at some 4½ hours a day. How? No more waiting around between coats. Instead of knocking off for 15 minutes while paint dries, the operator can start on the second coat right away.

Then just figure up the savings on other parts, plus costly rejects eliminated, and there's no question that Beechcraft's hot-spray has paid its way.

2. Better lighting—The combination of batteries of bright lights and better use of outside light has tripled visibility in Beech's paint booths. But this is only a temporary measure. New booths are being constructed now, completely enclosed by glass windows, which are expected to give a ninefold increase in visibility.

Paint overspray will be eliminated by sheets of water along the walls, designed to act as filters. Fans will pull the paint-laden air through this water wash. No more working blind. Beech knows that better lighting makes it possible to do a better job faster.

3. Better handling—Allen and Wagner knew there would be no use in making improvements if good paint jobs were going to be scratched off farther down the line. With his assistants, Allen toured the plant in a determined attack on the problem. They took tool boxes and felt pads off wings, made it clear to workers that wings were no longer to be used as workbenches. Not even a paper or inspector's clipboard was to be placed on a painted surface.

They tracked problems to their sources. They found an identical scratch on the wing of half-a-dozen successive airplanes — same job, same scratch on every plane. They traced it back to the belt buckle of one of the men on the line. Now he's wearing another belt.

Allen cracked down on haphazard handling, thus eliminated bumps or accidents that might harm finishes. It had long been the custom to station men at each wingtip to steer the planes slowly down the lines—but it didn't always work out that way in practice. Now it's an obligatory rule.

Biggest success came in overcoming the idea that things had to be done the way they were being done. Nobody used to worry about scratches because it was an accepted fact that paint jobs would have to be touched up — that's the way things were done. People shrugged their shoulders and figured that parts had to be fitted on the plane after it was painted and that planes just had to be scratched.

For instance, take the matter of fitting wings onto already painted fuselages. Previously wings were placed against the fuselage and trimmed to fit the contour—a necessary practice with conventional tooling. This method left ugly scratches on the paint. The tools just weren't built that could trim up wings prior to painting. There had to be additional trimming and fitting. That scratch down the length of the plane couldn't be eliminated —not without special tooling. But Allen and Wagner had special tooling designed. Now Beech uses a jig (see photo, left) that permits exact trimming of the wings before they're attached to the fuselage. Result: No more scratches.

Another cause of indifference lay in the fact that some of the parts were painted after they were assembled. Why worry? But worry was what the Allen-Wagner team thrived on. Now all parts are painted before they come up for assembly. And there's no question as to the success of these efforts. Today, touching-up is a special job—not the custom.

Effectiveness of Beech's program is best shown by the fact that the crew formerly used quantities of masking tape, masking paper, thinner, spray guns, and canvas covers. They spent their time masking, painting parts, making touch-ups, and stripping off masking materials. There were further delays in order to cover nearby planes to protect them from over-spray.

Now one man spends only a small part of his working day on final touch-ups. His equipment: a small brush and a paper drinking cup filled with paint.

FACTORY | IDEAS OF THE MONTH

By LEWIS K. URQUHART, Managing Editor, FACTORY

Now you can buy a lab — or expand present facilities — for 25% down, with the balance financed over a 3-year period. Sounds like a natural for small companies. Lab can be for research, cost control, product development. Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago 22.

PG wheel — for polishing and grinding — is made up of hundreds of pieces of cloth-coated abrasives. Here's why it's different: It removes stock as part of the polishing action. Shallow marks, for instance, on the face of the metal. Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6.

Do-it-yourself electronic anolog computer (Heath Co., Benton Harbor, Mich.) will sell for less than $750. For that kind of money you can't afford not to have several—one for each project you haven't started because of the length of time it takes for researchers to make computations.

Beef stew is just one of 14 hot-plate lunches and 13 heavy soups (not just thin broths) workers can choose from a brand-new vending machine developed by H. J. Heinz Co. (1062 Progress St., Pittsburgh 12). There's chop suey, chili, spaghetti, beans, lamb stew — and so on. Each machine holds 144 portion-size tins. Food is served in original container at 150 degrees. Simple maintenance—no tubes, tanks, or valves to clean.

And Perk-O-Fresh — while we're on the subject — seems to be the only vending dispenser that perks fresh coffee from real ground coffee as it serves. There's a continuous supply from 40 automatic 16-cup percolators. Interstate-United Coffee Corp., 1723 S. Michigan Ave., Chicago.

Snowtime ain't no time for being without a plentiful supply of ice remover. We suggest "Ice-Foe" whose maker (Walton-March, Highland Park, Ill.) claims it possesses exothermic action. Anyway, it melts ice good and fast. There's also "Ice Rem" (Speco Inc., 7308 Associate Ave., Cleveland 9) which contains a new ingredient that stimulates action of a phosphate-type rust inhibitor.

No peeking is possible if your windows have been brushed with a new paint developed by research engineers at New York University. Costs a lot less than special glass. For details, write Office of Information Service.

Extruderitems is a new periodical. Its purpose is to disseminate information on contour extrusion and vacuum forming of Bakelite vinyl, polyethylene, and styrene plastics. If you'd like copies of this and future issues, write Dept. 46, Bakelite Co., 200 Madison Ave., New York 17.

Direct-a-Call, we've just learned, is a low-cost, 2- to 10-station, inter-office telephone system that operates from a standard electrical outlet. Saves monthly rental costs for extension phones and frees city phones for outside calls. Connecticut Telephone & Electric Corp., Meriden, Conn.

Booklet of the month is "Paper and Progress" whose 32 handsome illustrated pages make you feel the impact that the growth of the paper industry has had upon many parts of our economy. Write now for free copy on company letterhead to The Mead Corp., Dayton 2.

Speaking of paper, we'd like to tell you about "Fanfold" (National Container Corp., 7 Central Park West, New York 23). It's continuous paperboard sheet for custom packaging. Brand-new. Comes in lengths specified by customer, and in 1400- to 1600-ft. bundles folded accordion-style. Folds can be specified from 4 to 8 ft. in length, from 78 to 85 in. in width.

Scottie is a pocket-size telephone amplifier for the hard of hearing. Or folks who use phones in noisy locations. Weighs only 3 oz. Clips over your phone receiver. Actually it's a reproducing receiver and a 3-stage amplifier with resistors. Price, $49.50. Remler Co., 2101 Bryant St., San Francisco 10.

Now the TelExecutive. This new speech prompter is a small and compact version of the well-known TelePrompTer. Weighs about 18½ lb.—almost as small and light as a porTable tyPewriTer. Operates by a palm-sized hand control. Sells for $495. Underwood Corp., 1 Park Ave., New York 16.

New safety eyewear frame, named "Titan" by its maker (Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.), combines strength of metal with adaptability of plastic. Gray frame is non-inflammable acetate butyrate, extra tough to withstand breakage. Metal bridge is plated to resist corrosion.

Readix is another computer designed to fill the need for low-cost, medium-speed computing services in small and medium-sized companies. For complete information ask J. B. Rea Co. (1723 Cloverfield Blvd., Santa Monica, Calif.) for its 12-page brochure describing this data-handling equipment.

There's a quick-unloading freight car you ought to know about. Its five compartments are accessible from either side of the car. Doors roll up into roof. Fork trucks can get in and out without doing any maneuvering inside the car. Unit Load Car Corp. (1501 E. 96th St., Chicago) will lease cars to shippers for $150 a month.

More From Your Suggestion Plan

Good news! Four horse-sense "audits" show you how to (1) get your shiny new system off on the right foot, or (2) change your tired old boondoggle to a boon.

SUGGESTION PLAN a laughing stock? Or even worse—the butt of sneers and cynicism? Or are your employees just plain apathetic? Unpleasant facts to face up to, but that's the reputation of many a well-intentioned suggestion system.

You needn't look far to find the trouble. In fact, just keep your ears open in your locker rooms and cafeteria. This is what was overheard at one company:

. . . *Personnel manager:* "The only thing I want to know about suggestion systems is how to get rid of one. Ours is the most annoying headache I've got."

. . . *Shop steward:* "We call our plan the sucker-gestion system. The company expects a man to tip them off to an idea that will drop five employees from the payroll."

. . . *Supervisor:* "I can't get anyone to pay attention to my ideas. But let any hotshot in the plant suggest the same idea, and he gets plenty of action."

. . . *Rank-and-file employee:* "I stopped sending in suggestions years ago. If management thinks any of your ideas will cost money to carry out, you'll just get the brush-off."

. . . *Another worker:* "The company expects to buy a $1000 idea for 10 bucks."

Why suggestion systems fail—Here are four reasons:

. . . *Foggy objectives.* Chances are this company set up a suggestion system for the sake of having one.

. . . *Disinterested administration.* Streamlined, impersonal handling is nearly as bad as fumbling and bumbling ineptitude.

. . . *Inadequate rewards.* Employees judge the worth of the program by the size of the awards. No amount of rationalization will make them happy with peanuts. Gratuitous handouts aren't the answer, either.

. . . *Sporadic, unimaginative publicity.* Routine announcements of awards and sporadic pleas for more suggestions won't hop up interest.

Here's a four-point audit that will guide you in setting up controls if you already have established a suggestion system—or in starting one right from scratch. It will give you a boon—not a boondoggle.

By H. T. McLAUGHLIN
Administrator, Suggestion Systems
Westinghouse Electric Corp., Pittsburgh

Audit 1 · BACKING

Do you really want a suggestion system? Before anything else, try to decide whether your company is ready for a suggestion award program. Ask yourself:

. . . *Does management believe in the principle of a suggestion system?* Is it aware of the impact on employee relations? Of its value as a communications media? Does it know the system opens another door for participation and cooperation?

. . . *What does management expect from a suggestion program?* To provide useful cost-cutting ideas that pay for themselves? Or to be a gratuitous give-away program? It can become either. It's up to you.

. . . *Will management support and promote the program*—by giving not only its blessing, but also the time, effort, and approval for funds necessary to maintain its integrity.

If you can't answer the above questions affirmatively and optimistically, then save your time and effort. Your company might better put its energy into something else.

What do you want the suggestion system to do for you? It will do many things for you if your main objectives are simple, direct, and honest. Such as . . . "The objective of our program is to secure constructive and practical suggestions from as many employees as possible." This way, nobody is kidding anybody.

Is the responsibility in the right place? Just as with any other good idea, poor administration can pull the rug out from under your suggestion program. It's best to assign responsibility to the department that's likely to benefit most from seeing it work out. If emphasis is on cost savings, the methods or industrial engineering department isn't the worst place. If emphasis is on less tangible things like participation, morale, communications, then the personnel department might be better. In any case, don't assign it in an area of disinterest.

Do you agree on basic rules? Early establishment of policy is a *must.* Make it fair, but firm. Steer clear of give-away possibilities. Awards must be earned—not won by chance. Set down for yourselves and your employees a written set of ground rules. These should be within a simple framework that protects (1) company and employee legal rights to ideas produced, (2) accounting procedures of company, and (3) standards of manufacture, purchasing, quality, etc. At Westinghouse we put our policies and procedures into writing. Two in particular illustrate the need for planning ahead how to meet certain tough situations:

. . . *Eligibility.* It's not a matter of who is permitted to submit a suggestion. It's a matter of who can get paid for it. Those who—because of their job responsibilities—are declared ineligible, aren't likely to use the formal system anyway. But the border groups of first-line supervisors, draftsmen, and technicians pose a delicate problem. It's pretty hard for a foreman to see you award one of his workers $500 for submitting an idea that would get him no more than a pat on the back. On the other hand, the way many companies see it, an essential part of the foreman's job is to be on the lookout for ways to improve

 Begins on page 114

methods on his job. Compensation is included in his salary.

But hardheaded people still say the prime objective of your system is to get constructive ideas. It's not important where they come from. This argument shows you the absolute importance of clearing this item of policy beforehand—and arriving at one that meets the general understanding and approval of supervisors. Your program will depend a great deal upon their support.

. . . Acceptable and excluded ideas. It forestalls complaints if you spell out what areas of operations you judge—in the best interests of management—to be closed to employee suggestions. Such areas might include matters beyond company control; items in the labor contract; policies dealing with employee benefits, advertising, public relations; operations under development; ordinary maintenance problems such as placing items in stock, revision of telephone directories, and other matters generally recognized as routine.

Is the union's role a passive one? If you have a union, sooner or later you're going to have to face up to its role in running your suggestion system. There's no real reason why it should participate. It's generally agreed that suggestion systems are part of the responsibility for spending company funds—that management should retain this prerogative, and that it should not be subject to bargaining rights. But some companies have invited members of the bargaining unit to serve on suggestion committees in much the same way that the labor-management committees functioned during World War II. Many companies claim success with this method. But we at Westinghouse view the union's role as a passive one, and our system remains wholly as a function of our management.

Does your suggestion system pay for itself? The aim of a suggestion system should be to pay for itself. For one reason or another, this isn't always what happens. But if you stick rigorously to your prime objective — not necessarily to the exclusion of rewards for intangible suggestions — your chances of having a successful, vigorous program — one that will balance out economically, too — are good.

In a survey made a few years ago by the National Association of Suggestion Systems, average cost for handling suggestions was found to range from 20¢ to $15. At Westinghouse we find it to be approximately $9.50. Our philosophy is that, when enough people keep suggesting, the chance for the big bell-ringers, the real money-makers, to come through is pretty good. As a result, the plan more than supports itself.

Audit 2 · ADMINISTRATION

Have you got a good man in charge? Fixing responsibility in the right slot in your organization is only a start. You'll need to be doubly certain to get the right man (or woman) to run the job. It's one that requires judgment, tact, sincerity, as well as lots of drive and enthusiasm to push it through. It saves time and effort, too, if the man in the control spot knows his way around your organization.

Is your committee a working one? You'll need a strong committee to back up your administrator. Anywhere from five to seven members is a good number. Too many slow it up. Too few are likely to make it arbitrary. Experience shows it's a good idea to get a sampling of the following departments on the committee: time and motion study, cost reduction or methods, accounting, engineering, maintenance. Plus someone from the works manager's staff.

Make the committee's decision final and not subject to appeal. At Westinghouse the suggester agrees, by signing his name on the submittal blank, that "the decision of the local committee on all matters pertaining to this suggestion, eligibility for an award, and the amount of the award, if any, will be final." Such broad responsibility placed in the committee's hand is another argument for making sure high-level men sit on it.

Do you protect the suggester? Your employees want to be certain that knowledge of who the suggester is won't influence the committee and evaluators one way or the other. Originally it was thought the only

HOW NOT TO MAKE YOUR SUGGESTION SYSTEM WORK

It's often the little things, piled one on another, that finally capsize your plan. If you really want to kill it:

1 **Build a backlog.** There's nothing like a pile of suggestions not acted upon to show management's general indifference toward the plan.

2 **Adopt a negative attitude.** Like "What can we find wrong with this suggestion?" If you look hard enough, you're sure to find a peg on which to hang a rejection.

3 **Use lots of generalities.** Double talk and evasiveness in stating your evaluations will quickly show employees how much their suggestions are really wanted.

4 **Be a hair splitter.** If you're enough of a sea lawyer, you can find a rule to block any suggestion. With enough red tape you can cut participation to zero.

5 **Let forms and paperwork do the job.** If your procedure is set tight enough, you'll never have to face your suggesters. This way, you can be sure the value of your program as a communications device is kept to a minimum.

6 **Keep foremen in the dark.** They're likely to be sure the whole idea is to make them look bad anyway. So, if you discourage their interest, they'll give you an assist in your sandbagging efforts.

7 **Don't follow up.** Assume your procedure is foolproof. This gives the cynics a chance to put the evaluation request at the bottom of their baskets. After 30 days they may even "lose" it.

fer another possibility, although

Do you have supplemental gifts?

Some of our plants make a point

way to do this was to guarantee *anonymity*. At the opposite point of view is the *fully identified* method. Banking on a history of integrity, this plan calls for the suggester's name to be known to all interested parties from the moment it reaches the committee.

The more common, middle-of-the-road solution calls for *partial identification*. The suggester's name is known only to the suggestion committee secretary. Only when additional information is necessary may the committee or members of the evaluating department learn the suggester's identity. That's the way we do it at Westinghouse.

Do you make it easy to submit suggestions? Use of simple forms and lots of pickup spots makes it easy for workers to participate. Make a point of collecting suggestions frequently and regularly. An employee hates to think his hot idea is moulding in the box. At Westinghouse we avoid this criticism by promoting the use of regular shop mail for the purpose. This way there can be no delay.

Do you speed up processing? Nothing kills a suggestion program faster than failure by the committee to act promptly. Routine processing such as acknowledgements, assigning of code numbers, etc., should be speedy. Keep a log with some sort of tickler system to flag those held beyond a reasonable period. Your committee should not only meet regularly but also set some maximum number of accumulated suggestions (say 5) beyond which a special meeting is called. If, as sometimes happens, there's a prolonged delay in getting the evaluation, write the suggester to let him know about it. Try to give him the specific date when he'll get a decision. And, of course, it's up to the administrator to keep pressure on the evaluators for prompt action.

Do you keep the records straight? Here's a quick rundown of matters that are best recorded in a routine manner on standard forms:

. . . *Suggester's record card.* A complete history of each person's suggestion and eventual disposition.

. . . *Suggestion analysis form.* Serves as a worksheet for the investigation department to provide a uniform approach in determining merit of the suggestion.

. . . *Notice of adoption.* This is a two-way form: First it's used by the committee to notify the benefiting department of the acceptance of the suggestion. Then it's used by the department to certify when the suggestion will be installed. This helps you follow the maxim: "Never pay an award unless the suggestion is actually used."

. . . *Authorization to pay.* Prompt payment of awards is a *must*. To assure no slips, we use a multiple-copy form. It contains an advance pay copy to notify the accounting department to prepare a check pending final approval, a pay copy retained by accounting for its files, and a congratulations copy that goes with the check to the employee.

How good are your letters of rejection? If you want the suggester to keep coming back—and to have a good word for your program—you'll have to be careful how you say "No." Be sure the letter is factual and complete in its explanation. To say a suggestion is a duplicate of another, for instance, isn't enough. The worker will want to know what the other one was, when suggested, where installed, etc.

A good checklist to use when writing an employee to tell him his suggestion was turned down is:

. . . *Summarize his suggestions* so that he's sure you understand him.

. . . *Provide explanation* sufficient to show your evaluation has been fair and impartial.

. . . *Show appreciation* for the suggester's effort, cooperation, and desire to improve working methods and conditions.

Are your letters of acceptance appreciative? While an employee isn't likely to be critical of a letter telling him he's won an award, you'll want to be careful of any implication that you've thrown him a bone. Be sure to summarize his suggestion to show that it was fully understood. And tell him a little about how it will be installed.

Are you firm about cutoff dates? "They waited until they didn't have to pay me." That's the complaint of one worker who submitted a suggestion and had it rejected, only to see it put into effect a few years later on the grounds the situation had changed. This can happen unless you set a firm cutoff date (few people should argue about 36 months) after which the suggester loses priority unless he resubmits. Same principle should hold in the case of the award formula. If your cutoff for determining savings is specific (such as 12 months), you avoid petitions later on if the idea is extended to other departments.

What's your policy on rights and priorities? Just as with cutoff dates, your policy about rights and priorities must be concise and exact. For instance, be sure you cover these:

. . . *Priority of the suggester* as he submits the suggestion.

. . . *Rights of the suggester* in reopening or resubmitting previously rejected ideas.

. . . *Provisions covering the same suggestion submitted by two or more people.* (Will prior date control, or will you split the award 50-50? Or if both suggestions, while not alike, can be combined to improve a single method, will you split the award according to your own estimate of relative worth?)

. . . *Action open to a suggester* who's dissatisfied with a ruling against his eligibility, amount of an award, or scope of application.

. . . *Transfer of rights* such as copyrights and patents to company.

Audit 3 · REWARDS

Administration of today's suggestion systems is a far fetch from the days when a good idea brought just a pat on the back, a few-cents-an-hour raise, or a promise of promotion. One way or another, these elements are still present. But really to satisfy the motives of employees who participate, you'll have to get more specific.

Have you considered all choices? Cold cash is the most obvious way, and the most popular, of rewarding accepted ideas. But there are other ways that have merit, too. For instance, a savings bond is sometimes more dramatic. And, besides lingering a little longer in the worker's pocket, it does provide a national service. Merchandise certificates of-

fer another possibility, although many workers protest that these take away their prerogative to spend their money as they see fit. But, regardless of which way you pay off, don't let your recognition stop there. Personal congratulations, certificates of merit, other kudos go a long way in stimulating participation. In no event expect non-financial awards to supersede adequate cash.

Are your awards adequate? — How much is adequate is open to debate. The point to keep in mind, as with all incentives, is that your formula for paying off should be simple and easy for the worker to understand. Nothing less than 20% of the net or 10% of the gross savings for one year (whichever is greater) is our formula. And it seems to work. Some companies use a higher percentage, but cut the payout period. Still others use a sliding scale something like the piece rates that decline as the output increases. Many companies avoid setting a maximum award figure because it tends to put a ceiling on the thinking of the suggesters. For a minimum award, $5 or $10 seems to be an average. But as NASS warns, a case of "ten-dollar-itis" to avoid turning down a suggester "just because he tried" is sure death to any program.

How do you evaluate intangible awards? How do you put a dollar-and-cents tag on intangible suggestions such as occur frequently in safety and good housekeeping? This is a toughie. But, the harder you pin it down, the better results you'll get. One approach that works well is to devise a point system — so many points for degree of originality, ease of installation, extent of application, etc. For instance, one of your employees suggests that you paint the dark corners of your stairways white. It'll improve your housekeeping. How do you evaluate this idea? On a point scale you might rate it pretty low for originality and ingenuity, medium for ease of application, and pretty high for extent of application.

At Westinghouse the value to the company of such a suggestion is estimated first by the supervisor most familiar with the situation. If adopted, the award is fixed at 2% of the estimated value, but its value can be no less than the cost of installation.

Do you have supplemental gifts? A big problem with suggestion systems is to maintain interest. The next audit section discusses how this is done through publicity and promotion. But you can also supplement your cash awards with other things such as special certificates, awards for the best suggestion of the month or year, annual suggesters' dinner, tickets to a movie, or a dinner on the house.

Some of our plants make a point of getting a suggester's wife into the act. Invite her to the presentation. If the award is over a specified amount, she gets a personal gift. Westinghouse also gives special award emblems for suggestions worth (individually or collectively) $50 or more. When the suggester accumulates $500 or $1000 in awards (according to local policy), he gets a pin with a diamond inset.

Audit 4 · PUBLICITY

How's your suggestion system doing? Statistical proof of your system lies in two areas: (1) Does it pay for itself? (2) What kind of participation does it get? According to your objectives, one may be more important than the other. But, if you want a yardstick to measure your participation, here are the latest NASS figures:

National averages show that, for every 1000 eligible employees, you can expect 238 suggestions per year. (Participation will range upward to about 40% of the eligible employees, with an average of somewhere between 10 and 20% contributing.) And for all suggestions submitted (over a million in the survey total), about 25% are accepted. Average award payment is $27.90.

If audits 1, 2, and 3 show no glaring faults, and your participation is still down, maybe your publicity isn't showing.

Does your publicity tell the true story? Everyone knows the value of good publicity in promoting employee relations programs. But, especially with a suggestion plan, you need to plan your publicity for the long haul. If you put the emphasis on glamour, big awards, easy money, it's likely to backfire when the workers find you want only worthwhile ideas. It's better to concentrate on telling your employees about the simple, concrete purpose of your plan. And how they can participate. If plan is a good one, results and rewards will soon speak for themselves.

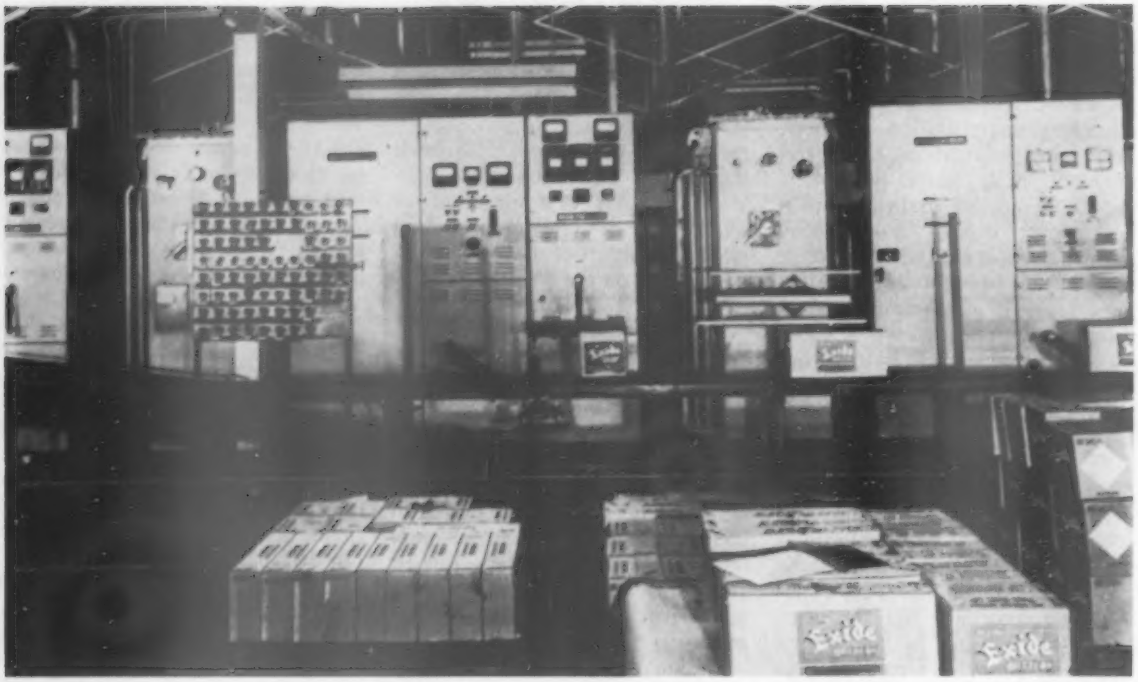
Is it aimed at management, too? Your supervisory and foremen groups will need special treatment. In addition to the general announcements (let them know about program changes in advance), you'll want to hold a series of training meetings to win their support. Supervisors need help to understand the part suggestion systems will play in operation of the plant. And what role they themselves must play to fulfill its objectives. Supervisors often have difficulty seeing the value of employee contributions in the first place — more so when these ideas receive recognition for a job the supervisor feels he is hired to do. He'll need a chance to discuss this conception in open conference before he'll shuck his suspicions and give the plan the cooperation it has to have.

What publicity do you use? Remember, your publicity objective is to develop more and better suggestions. Stimulate the thought, "If John Smith can earn that much with his suggestion, so can I." Show studies of suggestion awards and pictures of what the winner does with his money.

When it comes to the hard rocks of finding publicity outlets, the main limitation is placed by your imagination and initiative. Good publicity runs the gamut of letters from management, booklets that tell the story of mutual benefit to company and employee, pamphlets that provide useful hints on how to think up suggestions, success stories in your employee paper, announcements in the local press. Posters, pictures, slogans on the bulletin boards score a bull's-eye, too.

Do you give it a little hoopla? — When interest flags, that's the time to give a little spin to your promotional efforts. Drag out your idea file of gimmicks and stunts. Try a suggestion day, departmental contests, and the like.

For a list of available films on suggestion systems, turn to p. 320.



RECTIFIERS are available in packaged units that can be located anywhere. Double-ended unit shown above is located right in the middle of a busy manufacturing area. These packaged assemblies are low-cost and highly reliable.

More D-C: Trend Worth Watching

What's behind it? New packaged rectifiers. And a new concept of using them that banishes the old problem of high power losses and poor voltage regulation.

D-C POWER, after a long downhill slide, is on its way back. Main reason: Mercury-arc rectifier units now come in small packaged assemblies relatively low in first cost and operating cost, high in reliability. Plus a new concept in distribution: Get rectifiers out of powerhouse and into plant near load. This cuts to a minimum the headaches long associated with d-c power: high power losses in cables and poor voltage regulation.

Trend away from d-c—Even though most plant operating men were agreed that d-c motor drives provided excellent speed control, were cheap to buy and operate, they switched over to a-c motors. Why? Many factors contributed. The major ones:

. . . *Rotating machinery* was, until recently, the chief source of d-c power. These machines required heavy foundations, elaborate provision for ventilation, and large segregated areas for maintenance.

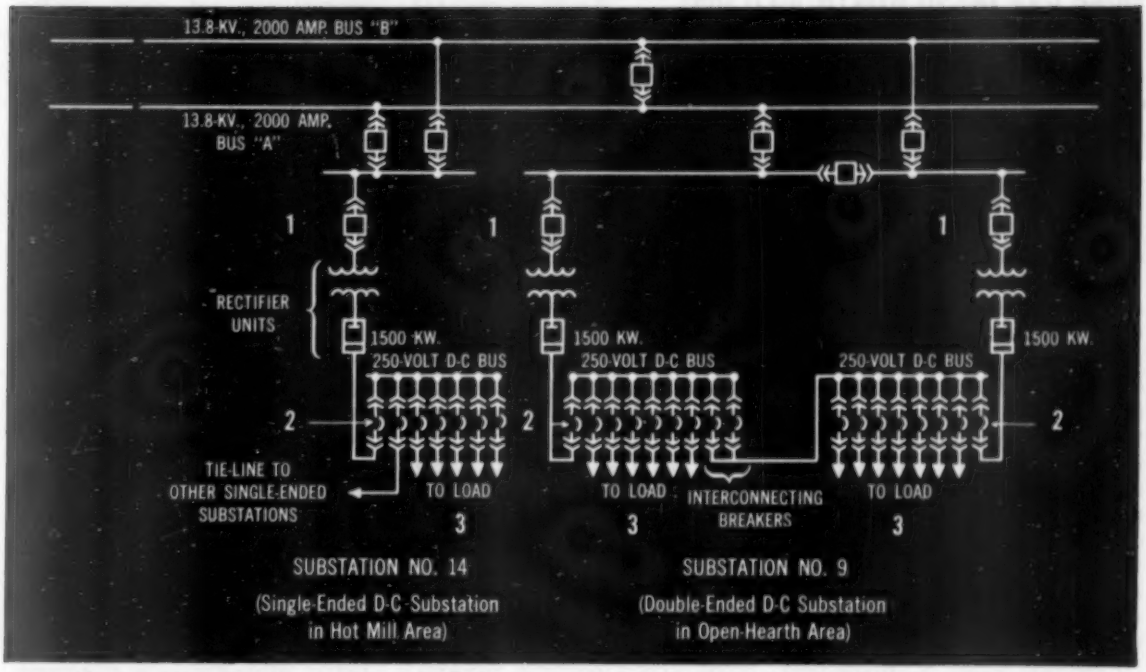
. . . *The powerhouse* was, consequently, the logical location for the machinery. Which meant long cables between d-c source and load. As plants became bigger, cables became longer. Few companies could justify subdividing the powerhouse. So poor voltage regulation of d-c feeder cables, and high power losses, became severe operating problems.

. . . *Feeder cables* often became a major installation cost, and cable losses a major operating expense.

The first step back—Not long ago, mercury-arc rectifiers—higher in efficiency, cheaper to operate—began replacing rotating equipment. But in most cases, they were located in the powerhouse. From one viewpoint, this made sense. It minimized installation cost. The d-c feeders, cables, and bus already existed from the powerhouse to the load. Watch engineers were available on the spot to attend the rectifiers. But the old disadvantages—high power loss and poor voltage regulation—remained.

New concept—The power loss and voltage regulation bugaboos are now being successfully licked by eliminating their source—long cable runs. The new trend is to move the rectifier units out of the powerhouse, spot them at load centers. In other words, spot them by using the economic load center theory on which the layout of unit substations is based. This is made possible, of course, by recent developments in small, packaged-unit rectifiers.

By PAUL TRIPLETT
Electronic Section
Allis-Chalmers Manufacturing Company
Milwaukee



DISTRIBUTION SYSTEM at U. S. Steel has 13 load centers, of which two are shown above. Six double-ended units (like No. 9) and seven single units (like No. 14) are built for unattended operation, self-protection, automatic control.

They're full of features that make the load-center concept possible:

. . . *No special foundations* are required. They can be located on balconies, on roofs, in basements. And the photo (facing page) shows a double rectifier d-c load center right in the manufacturing area.

. . . *Ventilation is a minor problem.* Most industrial rectifiers are water-cooled, don't dissipate much heat into adjacent area. The principal heat loss is from the rectifier transformer, and even this small heat source can be eliminated by placing the transformer outdoors. (Including the transformer, heat losses vary from 1¼% to 1½% of the kw.-rating of the rectifier—about the same as for a-c load centers.)

. . . *They're safe.* Those rectifiers that are metal-clad are no more hazardous to personnel than a-c unit substations are.

. . . *They're reliable.* Service continuity record of modern rectifiers is excellent. They perform with a minimum of attention. And can be tied together—as unit substations are—into a network system that really insures reliable service.

. . . *They take overloads in stride.* Rectifiers can operate for short periods with overloads up to 200% of rated capacity. That means that if you have tie cables between units, the failure of one needn't put you out of action. And it permits routine maintenance—such as tube replacement or heat exchanger cleaning—without disrupting service. (Tie cables, or double-ended units—same thing electrically—mean further power saving since some units can be shut down during light load periods.)

U. S. Steel's d-c distribution

One of the best existing examples of a reliable d-c distribution system is installed at U. S. Steel's new Fairless Works in Morrisville, Pa. The company uses a lot of d-c power—its 19 excitron mercury-arc rectifiers can supply 100,000 amperes of 250-volt d-c power—in such areas as the blast furnace, coke plant, open hearth, maintenance shop, and hot and cold mills.

The diagram above shows just 2 of the 13 load centers in the system. It virtually tends itself, and the fault protection is complete, indicates trouble spots fast. Here are the details:

Reliability—Six substations are double-ended rectifier units (like No. 9) and seven are single units like No. 14). The double-ended units provide maximum continuity of service. Adjacent single-unit load centers are interconnected with d-c tie lines, so that should one unit fail, adjacent units can take over its load.

Ease of operation—The rectifiers are designed for unattended operation, are self-protecting, and have many built-in automatic controls. For example: Closing the master control switch of the system causes the rectifier auxiliaries to be energized, and only if all auxiliary circuit conditions are correct will the a-c circuit breaker (1) close. This causes 250 volts d-c to appear across the rectifier terminals, which in turn closes the cathode breaker (2). If any condition in the rectifier circuit is not correct, the starting cycle will not complete itself and the problem will be indicated on a 12-position annunciator.

Fault protection—In U. S. Steel's system, each rectifier feeds its load through a group of automatic-re-

MORE D-C: TREND WORTH WATCHING . . . *Begins on page 118*

closing, load-measuring d-c feeder circuit breakers (3). Each breaker is equipped with an adjustable overload trip that will remove the feeder circuit from the 250-volt d-c bus in case of a fault, without disturbing rectifiers or other feeder circuits on the bus.

To make the d-c feeder arrangement completely selective, the rectifier cathode breakers (2) do not have overload trips, but are equipped only with reverse-current relays. Thus the cathode breaker will open only on a rectifier fault, forcing the feeder breakers (3) to furnish complete primary load protection. The rectifier a-c breakers (1) further protect against faults in the rectifier circuit by means of instantaneous trips. And in the event of a failure of a feeder breaker to clear a fault, they will protect the rectifier by means of inverse-time trips. The instantaneous trips are set at 700%, and the inverse-time setting is 200% of rated current.

The load-measuring reclosing feature of the d-c feeder circuit breakers (3) functions to measure the resistance of the load after a feeder circuit breaker has opened on a fault. As long as load resistance remains low enough to indicate the fault has not been cleared, the feeder breaker is prevented from closing. When load resistance becomes high enough, the feeder breaker recloses automatically.

Each excitron tube has a thermostat located in the outlet side of its cooling coil. If the outlet water temperature of any of the tubes rises above the temperature setting of the thermostat, the d-c rectifier cathode breaker (2) will trip, but the water pump will continue running. As soon as the water temperature drops below the pre-arranged setting of the thermostat, the d-c breaker will automatically reclose. This arrangement protects the rectifier from extended overloads above the 125% two-hour rating, while automatic breaker reclosing provides a quick way of restoring power. The excitron tubes are also protected against water-pressure failure by a pressure switch in the recirculating system.

If an excitron unit is overloaded prior to shutdown and the anode temperatures are above normal, cooling water will continue to circulate and the pump will operate after shutdown until tube temperature returns to normal.

A single-phase and reverse-phase relay is connected to the low voltage side of the auxiliary power transformer at each excitron substation. It will shut down the rectifier on undervoltage by tripping the a-c and d-c rectifier breakers if the auxiliary power fails. The drop-out or undervoltage setting of the reverse-phase relay is set low to permit the rectifier to ride through minor voltage disturbances.

The control compartment of each rectifier has several transfer switches that are used for test and maintenance purposes. Automatic-to-manual transfer switches are included for excitation, water heaters, water pump, rotary vacuum pump, and the voltage regulator. Output voltage of the rectifier may also be controlled manually with a separate grid-bias rheostat.

An annunciator on the excitron control compartment has 12 separate drops to assist in locating the source of any difficulty, and an alarm relay that sounds in the powerhouse when a rectifier is shut down.

YOU BE THE ARBITRATOR

THE CASE OF

The Reduced Incentive

Out of the experience of the American Arbitration Associaton

Early in 1954, Stevens Furniture Company began getting complaints about some of its cabinets. Found that finishers, on piecework, were doing a careless job of inspection. So management assigned the inspection part of the job to week-workers and reduced the rate for finishers.

"You can't do that," the union said. "Finishers have been inspecting for over 10 years and getting a negotiated rate for the whole job. It's too late to break the job down and change wage rates without consulting us."

Answered the company: "The contract permits us to change rates whenever there is a change in the product or method of manufacture."

The dispute eventually came before an arbitrator.

If *you* were the arbitrator, how would you rule?

For actual decision, see page 254.

Here's How to Save Steam Dollars

If Exide could, so can you—by making process and space-heating steam a prime target for cost-cutting. Let Exide's 10-step program show you the way.

SCOUTING for likely places to cut costs? Then don't overlook heating and process steam. If you do, you might miss out on what we've gained here at Exide.

Some time back we launched a "cut costs" drive in our mechanical operations. Went after plant utilities as well as other operating services. Found we were paying $150,000 a year for process and space-heating steam. This figure includes fuel and water—but not labor and maintenance. It was more than we were paying for any other utility except electric power.

So we made steam a prime target for cost-cutting. After two years we added up our benefits:

. . . *A 22% slash in heating steam.* In spite of a 5% load boost. How much in dollars and cents? Well, take 60¢ per 1000 pounds as nominal cost of steam. In January 1955 (972 degree days) heating steam cost us $1800 less than in January 1953 (800 degree days).

. . *Minimum generating cost.* We achieve it by maintaining the efficiency that was originally built into each generating unit and by operating our equipment at its most efficient levels.

. . . *Longer life for equipment.* We've smoothed out steam demands, thus reduced wear and tear on boilers, pumps, and other equipment.

WHERE TO BEGIN

When you reduce Btu. costs, better start in the power house. We did. We modernized ours—installed new boilers and combustion controls, overhauled auxiliary equipment. These improvements soon paid for themselves in fuel and labor savings. But that wasn't enough. Not for us. We realized that good generating equipment produces lowest-cost steam only when operated at highest efficiency. And that wasted steam—no matter how little it costs—is still costlier than no steam at all.

So we got busy. Some of the steps we took were one-shot measures. Others have become part of a cotinuing program.

Here's what we did:

. . . *Got the facts on steam generation and consumption.* We installed new flow meters and repaired those we already had. That way, we got accurate measures of steam generated in each boiler as well as steam used for boiler auxiliaries, heat, and major process operations. We added scales for weighing coal and meters for keeping tabs on fuel oil used by each unit. We hooked up the oil meters without bypasses, thus avoided incomplete readings. We installed oil-level gages in fuel tanks to check possible differences between the incoming fuel and the fuel consumed. And we put meters on make-up water supplies and condensate returns.

Thermometers? Lots of 'em. We placed them (including some recording units) on lines for incoming city water, feed water, make-up water, and condensate. And spotted recording thermometers on main boiler outlets, the exhaust stack, feed-water heaters, and hot-water generator outlets. Since then we've kept a regular check on temperature, have cut heat losses by locating them. (For instance, we found overheating at the hot-water generators.) Our temperature readings give us complete data on heat flow. Result: We've been able to cut the difference between heat input and known usage from 8% to 3%.

. . . *Set up a guide for operations,* based on our finding about possible efficiency in our steam generating equipment. Once we had put our equipment in tip-top condition, we tested its performance over a range of 20% to 100% capacity, simulating ASME procedures. We recorded settings, temperatures, drafts, fuel rates, and efficiencies. We drew curves for each to establish performance standards. And we measured fuel required to start up a cold boiler. We made our data up into a "Boiler Operation Guide," posted it on each unit. It enables us to use our equipment in its most economical load range. Today, for example, when several units are on stream at once, we adjust the more efficient ones to carry the biggest share of the load.

. . . *Repaired leaks in steam lines.* Tell-tale white wisps led us to them — inside and outside the plant — revealed disconnected lines with condensate running to drains, leaky safety valves, faulty pressure-reducing valves, open bypasses.

. . . *Checked up on the entire plant heating system.* Except for some high-pressure unit heaters, our system (vacuum-return type) operates from a low-pressure (3 psig.) supply through a reducing valve in the boiler house. In summer we filled these lines with water under pressure. This revealed many small leaks, which explained our high condensate losses and the high cost of running our vacuum pump.

. . . *Inspected our insulation.* Wherever steam-line insulation was damaged or missing, we repaired or replaced it. In some places we found pipes that had orginally been left bare to provide radiant heat. These were giving off uncontrolled heat in mild weather and our workers were opening windows to keep comfortable We covered those pipes.

. . . *Surveyed steam traps, investigated bypasses.* We found many instances of passing the traps. Reasons: bad traps, wrong types, improper sizes. And we found some high-pressure water heaters that

By A. FRED DELONG,
Mechanical Engineer
Exide Industrial Division
The Electric Storage Battery Company
Philadelphia

were trapped directly into vacuum return lines. So we made piping changes to prevent open bypasses, installed the conventional intermediate flash tank vented to the low-pressure system.

. . . *Looked for over- and under-heating.* Purpose: to find out whether design of our space-heating system suited our needs, whether we could save money by changes.

Our searches revealed radiators partly covered or blocked out, unit heaters with clogged filters or with beams or equipment blocking air flow and causing cold spots. We remedied these conditions at once.

Some areas were getting enough radiation for 24-hour operation — but were occupied only in daytime. They were overheated by sunlight —and by heat from manufacturing equipment. In these areas we cut out some of the radiation.

In other areas we reduced or abandoned overhead radiation, supplemented or replaced it with thermostatically controlled down-blast unit heaters. These pull heated air from the ceiling to the floor, counteract window drafts, consume less steam. They're especially good in high-ceiling areas.

We found some buildings that were heated throughout on the night shift, though workers occupied only small areas. So we installed local heating units. They paid back their cost in a few days.

Some places were underheated, often because of open windows or doors. Better supervision solved this problem in most places. Elsewhere, above shipping-dock doors, we installed high-capacity down-blast heaters controlled by thermostat and door opening.

. . . *Eliminated needless ventilation.* Good ventilation is a "must" in our plant — because we fabricate a toxic material, much of it in fine particles. If we reclaimed heat by recirculating exhaust air — even filtered air — we'd jeopardize worker health. Exide will not take that risk. So, to keep heat losses at a minimum consistent with safety, we urged supervisors to watch out for little money-savers — turning off ventilation in idle hours, closing slide dampers on equipment exhaust ducts when equipment is idle.

. . . *Overhauled the hot-water system.* We repaired the circulating pump, which didn't work. And we replaced some hot-water lines that were clogged. That way, we could run the system at lower temperature. Today, our workers don't have to open the faucets ahead of time to have hot water for wash-up.

IT NEVER ENDS

With all those big jobs done, we moved on. Here's what we still do:

. . . *Check performance of our generating equipment* against standards. If we can't bring a unit up to standard, we check to see if maintenance is needed. Some time ago, for instance, we found a slight increase in fuel rate with no change in CO_2 and other values. We shut down the unit for inspection. Found that a strut design was confining the flow of make-up water to only a few tubes, was causing internal sludging. Thus our performance check probably nipped in the bud what might have been a costly failure under load.

. . . *Look for the most efficient fuel for specific equipment.* Near the start of our program we studied one of our coal-burning units, found the cheaper coals we were buying for it were costing us more in total fuel dollars and equipment maintenance than higher-grade coals. So we designed our equipment for wider ranges of fuel characteristics. Now we can use the cheaper grades. Also, we redesigned our boilers to burn both coal and oil. And now we check often to see which will give us lowest cost.

. . . *Unload all the fuel we buy.* Two simple cases: frozen coal that clings to the side of the hopper car; oil trucks that are not completely emptied because the ramp is improperly pitched.

. . . *Track down fuel losses* in storage. Common fuel thiefs are oil leaks and spillage, spontaneous combustion of coal. We check our oil-tank gage readings regularly against fuel-feed meters, thus uncover leaks in feed lines or tanks. We calibrate instruments yearly.

. . . *Run at lower pressure.* We've cut it from 175 to 150 psig. We found we could do this after analyzing our steam processing needs and improving our operating practices. We gained slightly higher generating efficiency. More important — we cut heat losses in our piping system, including the small leaks that plague maintenance men.

. . . *Draw in sources of heat we formerly wasted.* Some time back, by means of an easy piping change, we ran warm cooling water from air compressors to a feed-water heater, thus saved both water and heat. Also a temperature regulator cut our water consumption, boosted compressor outlet temperature. And we've added a pressure relief valve to keep excess make-up from being fed when steam demand is low.

. . . *Adjust heat to outside conditions.* Early in our program we plotted heating demand against weather — outside temperature, wind, and condition of sky. We did this after we got our equipment in order. Now these curves guide the power-house engineer in meeting demand. He knows how much steam to dispatch through his manual regulating valve (the lower the pressure, the better). And he knows when to turn steam on in the morning, when to lower it during the day.

10 MORE COST-CUTTERS

Over the past two years we've explored many other suggestions for cutting steam costs. Some we found only slightly useful in our plant. Others were not suitable. But on the chance they might be helpful to others, here are 10 additional ideas:

. . . *Use automatic heat-control* systems.

. . . *Reduce peak boiler loads* by spreading the demand schedule.

. . . *Insulate sidewalls and roof.*

. . . *Reclaim waste heat* in exhaust air.

. . . *Zone areas for temperature needs.* For example, don't overheat a furnace room.

. . . *Humidify air to increase comfort* and make moderate temperatures more agreeable.

. . . *Use heat exchangers to reclaim waste heat* from process liquids.

. . . *Shut off unused steam lines.*

. . . *Repair dripping faucets,* provide foot controls on wash fountains and basins.

. . . *Replace broken window glass.*

18 Ways to Low-Cost Maintenance

Here's a Du Pont program that will serve as a guide to improvement of any maintenance operation, no matter how big or how small. Check your procedures against these and learn how you, too, can get the most for your maintenance dollar.

LOOKING FOR WAYS to help works engineers cut maintenance cost in our many plants is the job of my department. If I were asked to tell you what our experience has shown to be the *one best* approach, the answer would be easy:

There is no one best way. There is no one standard Du Pont procedure for cutting maintenance costs.

Actually we know of at least 18 basic administrative tools that can be used to cut maintenance costs and downtime to a minimum. And these tools are applied in varying degrees in different plants. The complete system used for best results in any one plant may vary considerably in make-up of the basic components. It's tailored to conform to the plant organization—to accounting procedures, tabulating equipment, product, plant size, location, and policy wishes of the plant manager. But by and large the final program evolves from a combination of most or all these 18 basic tools. And there's one common denominator in all of them: *They help cut maintenance costs.*

If your higher management is like ours, or any other good management, it wants to know the returns on an expanded maintenance program before spending money to install it. These returns are difficult to predict accurately, mainly because hardly anybody starts from the same base. Plants in the best shape have least to gain—and vice versa. What are the present conditions of manpower and equipment? What paperwork controls and methods are in use? The effects of these functions are so interrelated that you cannot evaluate the results of a change in any one of them.

Some of our plants that have introduced better maintenance procedures and controls have cut their maintenance costs up to 20%. In many plants the effectiveness of maintenance labor has improved from the range of 35-40% to that of 60-65%. In some, even better results have been obtained. And in reduction of equipment downtime and increased productivity, all these plants have realized savings that alone have justified the cost. Of this we are sure:

Every one of these 18 basic tools can help trim your costs and boost output.

But let's get some other facts straight. We at Du Pont don't aim just to *cut* maintenance costs. Anyone can do that, and get away with it for a while. But eventually the accumulation of deferred maintenance will catch up with him.

Our purpose is to cut the *manufacturing cost of the product* and still maintain quality. Also we're careful not to sacrifice employee safety. We've seen cases where zeal to attain low maintenance costs has ignored these important points, and wiped out expected savings.

Another point: Experience has taught us that the best maintenance controls are of little value unless correctly used by maintenance supervisors. Also higher management must give these controls its wholehearted support. There is no substitute for good management and good foremanship.

Now let's look at the 18 basic administrative tools for developing a successful maintenance program. They are listed in the order we think best to consider, install, and use them.

1. SET UP A RESPONSIBLE ORGANIZATION

And, in so doing, set up a separate maintenance control group. Endow it with the responsibility for over-all control of procedures, for establishment of training, for inspection and major overhaul procedures, as well as for summarization and analysis of maintenance cost information.

We are firmly convinced that the single greatest reason for the failure of any maintenance system is the error of not establishing a group who will be responsible for the system's operation.

2. USE A WORK-ORDER SYSTEM

This is the cornerstone of maintenance control. We use a written work-order procedure which requires that every maintenance job be requested on a standard form. This provides a written contract to do the work and forms a basis for equipment records, job analysis, work scheduling, and finally work measurement.

We issue serially numbered separate work-repair orders for work in excess of four man-hours' labor or $40 material charge. For lesser work we use an unnumbered patrol order form, for which the work is charged against the general equipment piece and account number. Patrol orders account for 50% of total orders issued, but only 12% of total maintenance man-hours. A third "blanket order" form is written periodically to cover repetitive scheduled maintenance work which can be clearly defined and accurately estimated as to man-hour requirements.

3. KEEP EQUIPMENT RECORDS

In many plants each piece of equipment has a separate record card. It provides a permanent record of the maintenance performed on each piece and the cost. It also serves as the basis for justification

By JESSE C. JESSEN
Engineering Service Division
E. I. du Pont de Nemours & Co., Inc.
Wilmington, Del.

of equipment replacement or selection of the most desirable type when several types have been used.

4. ANALYZE AND PLAN JOBS

In our opinion each repair order must be carefully analyzed. In some plants this is the responsibility of each maintenance foreman. In others, a separate planning organization performs this work, leaving the foreman free for direct supervision and personnel problems. In any event, the planner analyst, or foreman, must determine exactly what is to be done, what parts are needed, and what tools and equipment to supply. He can then decide who does the work, and how many man-hours it will take.

5. MAKE WEEKLY FORECAST

Weekly forecasting is basically an agreement between maintenance and operating departments and the maintenance control group as to the probable days of the following week when major jobs will be done. We usually start scheduling on Wednesday, using preventive maintenance schedules as a basis. We have found that about 75% of the work included in a weekly forecast can be performed as specified.

6. PREPARE DAILY SCHEDULES

Our daily schedules are usually prepared by each foreman before 3 p.m. for the following day. There's no waiting for assignments by maintenance men every morning.

7. SET UP A MANPOWER CONTROL

There are only two ways to cut maintenance costs—reduce labor and material costs. All these maintenance controls fail in their purpose unless they do this or achieve savings by other methods, such as reducing product loss. A backlog control of manpower requirements tells you when you have too large or too small a crew in each function, area, or shop for the work ahead.

8. SET UP A PREVENTIVE MAINTENANCE PROGRAM

In other words, do maintenance when *you* want to rather than when *equipment* wants you to. Through preventive maintenance we are able to do most of our maintenance work in daylight hours on the day shift. We schedule it so that manpower is continuously busy instead of working in surges. This greatly decreases overtime costs. Also we can maintain a whole production process at one time rather than shut it down four or five times to maintain single equipment items in a continuous process. This greatly reduces product loss.

As an outstanding example of the amount of maintenance work that can be set up on a regularly scheduled preventive basis, one of our plants does 60% of all its maintenance work—including major overhauls—by this method.

9. USE BUDGETARY CONTROL

It would be difficult to establish a workable maintenance budget without the advantages of the eight preceding tools. They pinpoint 50-60% of our requirements. We prepare a maintenance budget on an annual basis, broken down into monthly subdivisions. The monthly budget varies according to seasonal requirements and vacations. It is not a fixed budget but a guide to staying within the annual budget, which *is* fixed. Attempts to restrict the monthly budget to a fixed amount could be detrimental and costly in the over-all picture. The budget may be set up by plant area or product if the maintenance responsibility is so established.

10. PROVIDE MATERIAL CONTROL

Two steps are involved. One, we establish accurate maximum and minimum amounts for all stores items, material, and replacement parts. Two, we make sure the system is followed in every detail.

This second step is important to build up confidence by the maintenance organization that materials will always be available. Otherwise the maintenance men will establish caches of critical items in remote plant areas—and this practice can prove costly. Sometimes such materials are exposed to corrosive gases and liquids. Also the exact contents of the cache are seldom known, and much time is lost hunting a desired item. Adopt the type of parts distribution system you need—whether all centralized or with sub-depots—depending on factors such as plant size and type. But, whatever system you establish, be sure to use it.

11. PLAN YOUR PLANT SHUTDOWNS

This is important for large-scale, continuous-operation plants where any lost production is costly. First we determine the expected life of various critical components in each equipment group. Next for each group we establish the shutdown frequency that permits the over-all minimum downtime. Then we fit in the planned shutdowns for other equipment groups. Such a program permits us to hold our maintenance organization to its smallest possible size and to operate with a minimum of maintenance overtime.

12. SET UP MAJOR OVERHAUL PROCEDURES

We believe there is usually "one best way" to disassemble, check, replace parts, or reassemble any piece of equipment. We determine the best method through collaboration by our engineers, foremen, and maintenance men. After such study we write down the required crew size, and establish overhaul steps in proper sequence. Also we list required tools and probable parts requiring replacement. We question every move, always look for a better method or tool.

Our plants have discovered many ingenious methods to reduce overhaul time up to 50%. A typical example is that of having workmen enter an oven that's being slowly cooled, wearing air-cooled asbestos suits—thus saving precious hours.

13. DEVELOP STANDARD PRACTICES

These differ in type from overhaul procedures in that they are very detailed and usually apply to minor

repetitive jobs or shop work. We have prepared complete manuals for each machine tool in the central shop, giving proper machining rates for all materials in all work rigidities normally machined. Proper tooling is also described. As a result some plants have more than doubled machining rates.

Standard practices for area maintenance men are also helpful. They show preferred hand tools and methods for various operations. For example, in many operations a powder-activated stud driver is preferred over drilling a 3/8-in. hole in concrete and using an expansion bolt.

14. USE WORK MEASUREMENT

It's a measure of labor effectiveness. But it also helps pinpoint areas where labor is inefficient and the reasons why. By measuring the amount of time actually taken on a job, and comparing it with a measured standard, we can evaluate our labor performance. As soon as you have set up standard practices for repetitive operations such as threading pipe, welding, machining, sheet metal work, and so on, you can insure their most effective use by having the timestudy men set up standard times for them. This permits the total time allowed for performing an operation to be based on fact, rather than on custom, habit, or past practice.

15. IMPROVE YOUR EQUIPMENT

This is a long-range program aimed at simplification of the maintenance problem by making critical parts more accessible, or at better material and design to require less frequent replacement. Standardization of design is also considered wherever practical.

For example, an extensive survey of heat exchangers resulted in standardization that permits not only interchange of tube bundles, but also the tube bundle ends to be cut off—so the bundles can be reused in shorter heat exchangers. This was done after it was determined in one plant that 70% of heat exchanger maintenance was retubing, and that most of the tube corrosion occurred at the tube sheet.

Further study revealed excessive corrosion and leaking as a result of poor rolling procedures, soft tube sheet material, and insufficient space between tubes. The use of ferrules for particularly corrosive service was investigated and recommended.

16. TRAIN YOUR SUPERVISORS

After accomplishing the first 15 steps it would be easy to conclude that adequate maintenance needs only perfunctory supervision. Such is not the case. We have learned that all levels of maintenance supervision must be trained to understand and use the maintenance controls. An important part of the training is to emphasize that the maintenance controls have the strong support of management.

Specifically, we have found it necessary to train foremen how to prepare work orders, equipment record cards, job analysis sheets, and so on. Our problem is to impress lower levels of supervision that preplanning and scheduling must precede the actual work if we are to provide good job effectiveness.

17. TRAIN YOUR MAINTENANCE MEN

We occasionally have the interesting experience of starting a plant at a location where practically no trained maintenance personnel are available. By means of a training program it has been possible within a three-month period to train these men to do the job satisfactorily.

To accomplish this, we have divided the training program into two parts. Part 1 covers fundamentals such as blueprint reading, shop mathematics, use of small hand tools, and field sketching. Part 2 covers information and instructions necessary to develop the skills required to maintain the specific plant equipment involved.

A training manual is prepared for each part of the program. The portion of the manual for equipment or instruments peculiar to a plant is modified for each plant to contain specific examples of equipment located at that plant. Information such as equipment disassembly procedures, operating tolerances, and trouble-shooting techniques is included. An intensive classroom training program is used, including demonstrations with actual equipment and progress tests.

We have also used training programs profitably at established plants where a new area is constructed, or where it's desired to increase the effectiveness of experienced maintenance personnel. This latter training is the most difficult for obtaining interest and cooperation, but produces surprisingly good results. In one plant training alone resulted in a 3% average increase in effectiveness.

18. ANALYZE PERFORMANCE AND COSTS

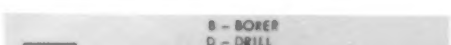
This is the job of continuing self-criticism of our maintenance operations. A typical method is to set up a code numbering system for each major unit in an area, a subcode for main parts of a unit, and a sub-subcode for subassemblies, and so on. Thus we might have 8 loading machines numbered 1 to 8, each with 6 heads numbered 1 to 6, each head with a motor, drive, etc., each of which is numbered.

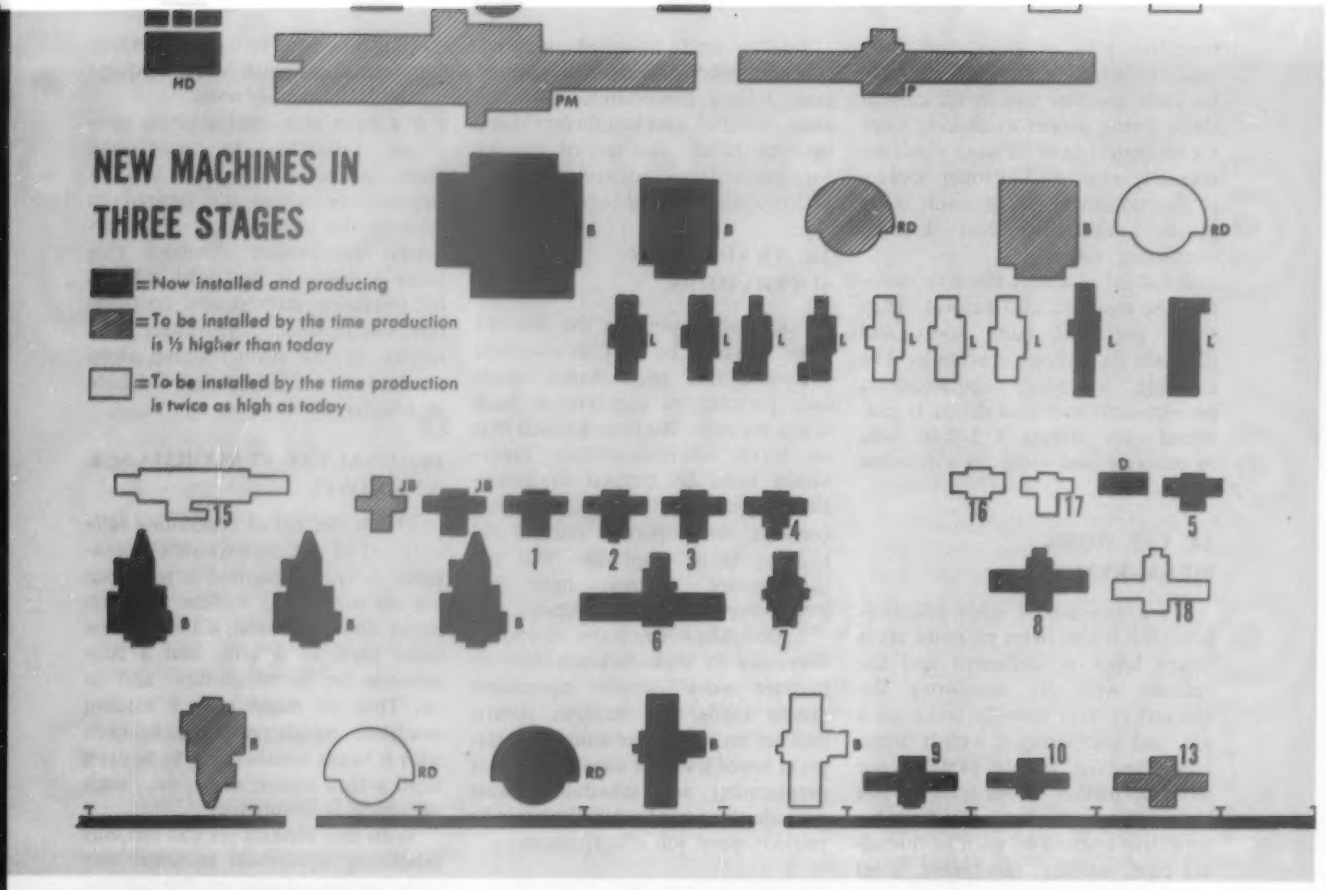
With this method we can use our tabulating equipment to select any code in any column so that we can summarize the maintenance costs of any part. Or by different tabulating set-ups we can determine the annual maintenance costs of all piping, valves, shafting, motors, or other important units. None of this, of course, can be done without a satisfactory equipment-record card system, or equivalent.

After we obtain a breakdown of item costs we know what the high-cost items are. Thus we can concentrate on reducing them by redesign or improved maintenance methods. Similarly, we can use the tabulating system to determine the amount of direct, indirect, and general maintenance being performed. If the amount of indirect maintenance (any maintenance not required to make the plant operate —such as relocating valves for convenience, repainting for appearance) exceeds 20%, we scrutinize the details carefully, spot all unnecessary items, and take steps to prevent their repetition.

Our attitude always is:

Question every big high-cost job. Throw out all the unnecessary ones. Do the rest promptly and well.





ROOM FOR PLANNED GROWTH. Throughout the plant, tomorrow's machine tools will go in beside today's.

Now — the Three Stage Layout . . .

. . . shows what new machines will be needed to meet future growth demands — and just where they'll go. A Kearney & Trecker aid to current operating practice.

BIG ENOUGH to produce double our present volume. That's the way we planned—and built—our new 173,000-sq.-ft. plant for the Special Machinery Division of Kearney & Trecker Corporation. We did it that way because we think there's an excellent future in building special machinery like the transfer-type units associated with automation.

But in our new plant we installed only enough equipment and machines for today's needs, spotted each machine with the future in mind. The plant layout drawing above (shows only part of the plant) tells what we installed. And what we can add—as need develops—without moving this machinery.

We planned for tomorrow—Because of the remendous future automation and mechanization have created for specially designed machine tools. Our forecasts show that demand will at least double in the foreseeable future. So it would be ridiculous to build a plant that's suited to present needs but insufficient for needs a few years from now.

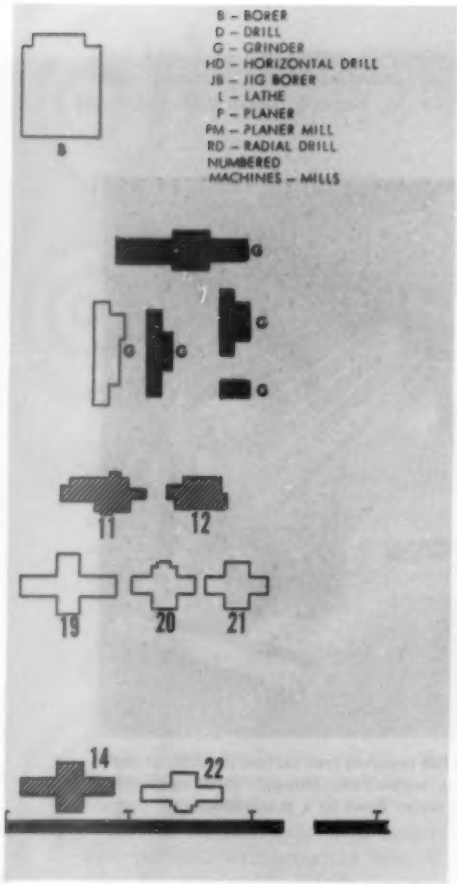
On the other hand, it's not good business to buy machinery you don't need—especially twice as much as present volume requires. If you did, some machines would get little or no use for several—or even many—years. With the cost of machine tools what it is today, everyone (including manufacturers of machine tools like ourselves) wants—and must get—maximum output from every piece of equipment.

So we budgeted for our new special machinery plant on the basis of:

. . . A building (including plant service lines) capable of housing equipment for double present output.

. . . Enough machinery to produce a volume sufficient to meet present and immediate future demands.

By J. P. BUNCE, Assistant to Vice President—Manufacturing
Kearney & Trecker Corporation
Milwaukee



How we looked ahead—Before we could design the building we wanted and needed, we had to know how much and what type of equipment we would need at specific future production levels. Our first step: Forecast future machinery needs. Basis for these calculations was projected sales volume figures. The sales department provided these figures and our division manager, plant superintendent, and control manager reviewed them.

Our projected long-range sales forecasts indicated our dollar volume of special machinery business would double in the foreseeable future. By working back from these sales forecasts we found the number of each type of machine needed for different dollar volume levels. From experience we already knew the ratio of machine load center capacities (in hours) to sales volume (in dollars). Thus it was easy to convert dollar sales figures into machines and man-shifts. Without this mix ratio we probably couldn't have formulated our plan with any accuracy.

Next we calculated the number of each type of machine tool we needed, or would need, to produce efficiently at three different sales volume levels. These levels are:

. . . *Present sales volume*. Our figures told us we needed to install 41 machines immediately.

. . . *Double present sales volume*. A total of 73 machines eventually. This gave us a good indicator for calculating how much space we would need in the plant.

. . . *One-third over present sales volume*. 51 machines needed to produce at this level. We computed for this volume level because it represents a checkpoint between the other two levels.

We based all these calculations on two-shift operation. This means that in a national emergency we can at once boost production substantially by adding a third shift.

Figuring on the machines required for doubling our capacity, we laid out our plant. Our production-area layout shows that all the machines we estimated we'll need for twice our present production have been properly spotted. There's adequate work space around each machine. In addition, we provided 6- to 10-ft. aisles for servicing the area. On the basis of this layout we designed and built our new plant.

But with the building completed we installed only the machines we needed for current production schedules. On the layout drawing these machines are in solid black. By the time dollar volume increases by one-third over present volume, we will have installed the machines marked with slanting lines. And by the time dollar volume reaches twice today's level, the machines that appear in outline will be added. Of course, these machines won't be added as we reach our benchmarks. They'll be installed one at a time as they're needed.

To see more clearly how we plan to add equipment, look briefly at the milling machine set-up:

. . . *At present volume* we've installed 10 milling machines (Nos. 1-10 on the drawing). They operate a total of 16 shifts per day.

. . . *At 33% above present volume* we will need four more millers (Nos. 11-14). Total will be 14, operating 21 shifts per day.

. . . *At double present volume* we'll need 8 more millers (Nos. 15-22), bringing total to 22. These will operate 34 shifts per day—a little more than double the hours of our original installation.

How good are predictions?—We don't expect 100% accuracy. Changes in product design and other factors will occur as time passes. These will alter our original calculations. But we're sure our basic plan and our building are flexible enough to accommodate future changes as they come along.

For heavy machines, we will build special foundations as needed. We'll need about a dozen of these in the future. But lighter machines—mills, grinders, and drills—don't need such foundations. They rest on the 2-in. creosote blocks that cover our 8- to 12-in. concrete floors. This adds to the over-all flexibility of our layout.

To insure flexibility further, we established a minimum bay width of 50 feet. Fact is, three of our six bays are 60 feet wide. And overhead clearance is no problem. Distances from floor to crane hook range from 19 to 32 feet.

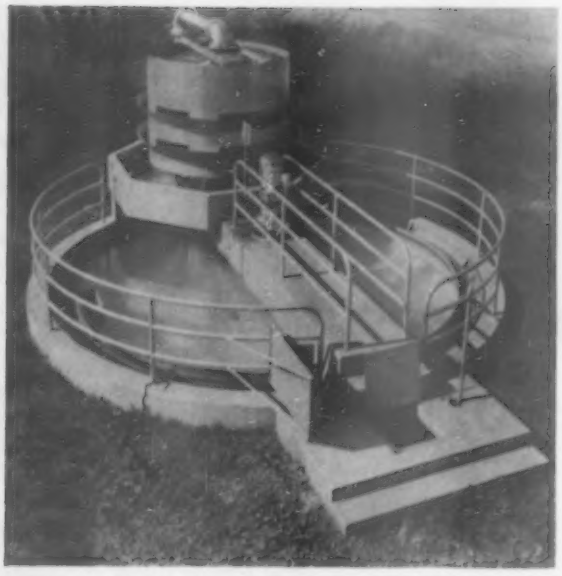
Plant services—We installed service lines large enough to take care of all the additional machines we expect to need. Hooking up the new units won't be hard. We have plug-in bus duct to distribute 480-volt power. Water and air lines have T connectors at each column so they can be tapped.

But in buying major items of service equipment we followed the same reasoning we did with production machinery. We left plenty of room for future growth—installed only what was needed now. For instance, we now use two steam boilers and have space for a third. Likewise, we operate one 200-hp. air compressor and have plenty of room to install a second similar unit.

Office facilities also were designed to maintain a balance with manufacturing capacity. That's because, as our manufacturing volume increases, so will the size of our sales, engineering, control, processing departments. So it's important to plan for this phase of the operation.

View beyond tomorrow—We've thought of the long future, too. The entire west wall of the plant is curtain wall—can be knocked out easily. And footings with bolts in place have already been extended beyond the wall. We're ready to attach the steelwork for an addition.

FLOC-FORMER makes turbid water clear. Agitation in cells "flocs" precipitated impurities—which sink to bottom of settling basin. Settled water is drawn off top, then filtered.



COKE TRAY AERATOR removes free carbon dioxide, oxidizes iron and manganese as water rains through three coke trays into catch basin. Here water flows to a precipitator.

How You Can Get Better Water

Whether your plant uses a lot or a little, water is costing you money if it isn't just right. So better let this expert tell you how to tailor water to your needs. You'll get back your investment with better products, less maintenance.

WORRIED ABOUT WATER? And what it can do to your equipment, your processes, your products? You may have had some restless nights after reading about the damage common water impurities can do (FACTORY, October 1955, p. 116).

Fact is, though, you can have water of any quality you want — if you treat it (see photos). Here's what's in it for you:

. . . Higher product quality.

. . . Lower operating costs.

. . . Less maintenance expense.

. . . A sure return of the cost of water-treatment equipment.

The trick is not to spend money foolishly to remove impurities that don't harm plant or product. It may be enough just to reduce the harmful impurities to harmless tolerances. Also you may need to treat only parts of your process water. Or you may need different treatments — some cheaper than others — for parts of the water for various end-uses. For example, certain alkaline bleach waters need only a reduction of calcium hardness; cooling waters, reduction of calcium alkalinity; cleansing waters, removal of both calcium and magnesium.

It will help you survey and establish your needs if you know the methods of water treatment and the equipment used in each. Usually you'll need a water-treatment engineer to diagnose the problem and suggest solutions. But you can evaluate his diagnosis better — and act confidently on his recommendations — if you have some knowledge of the causes and the cures of your water troubles.

You already know the causes if you read the article in October FACTORY. Now take a look at methods of treatment. There are two general methods of getting the kind of water you want and need:

. . . Clarifying turbid or colored surface waters by such processes as sedimentation, coagulation, settling, filtration, and removal or reduction of tastes and odors.

. . . Further treating already clarified or naturally clear ground waters by such processes as chlorination, aeration, deaeration, chemical inhibi-

By ESKEL NORDELL
Director of Technical Information
The Permutit Company, New York

tion, iron and manganese removal, silica removal, water softening by the hot lime-soda process or by sodium cation exchanger (the zeolite process), hydrogen cation treatment, distillation, and demineralization.

How to clear up turbid waters

Sedimentation—Usually is employed only with swiftly flowing surface waters that carry large quantities of coarse, easily settled sediment. It's done by reducing the flow of water to such a slow pace that the load of sediment drops out. This method may be effected in sedimentation tanks, basins, or reservoirs. Tanks or basins are usually baffled to create long water runs and prevent short-circuiting. The accumulations of sediment must be removed or dredged out regularly.

Length of time water should be detained in a tank or basin is best determined by timed experiments on the water to be handled. In practice, this varies from several hours (tanks or basins) up to several days or one or two months or longer (reservoirs).

Except in extremely long detention periods, sedimentation usually does not thoroughly clarify the water. It therefore should be regarded simply as a preliminary treatment that removes only coarse sediment. For thorough clarification, coagulation followed by settling and filtration is usually required.

Coagulation—Much of the finely divided suspended matter (turbidity) and color can't be removed by plain filtration. Instead, these materials must be coagulated into larger particles, which then may be removed by filtration, or by settling and filtration. The first of these—coagulation plus filtration—is usually practised only with waters of low turbidity, when color removal is not important and the flows of water to be handled are not large. The second—coagulation plus settling plus filtration—is used in cases where large amounts of turbidity are present, for color removal, or when quantities of water to be handled are large.

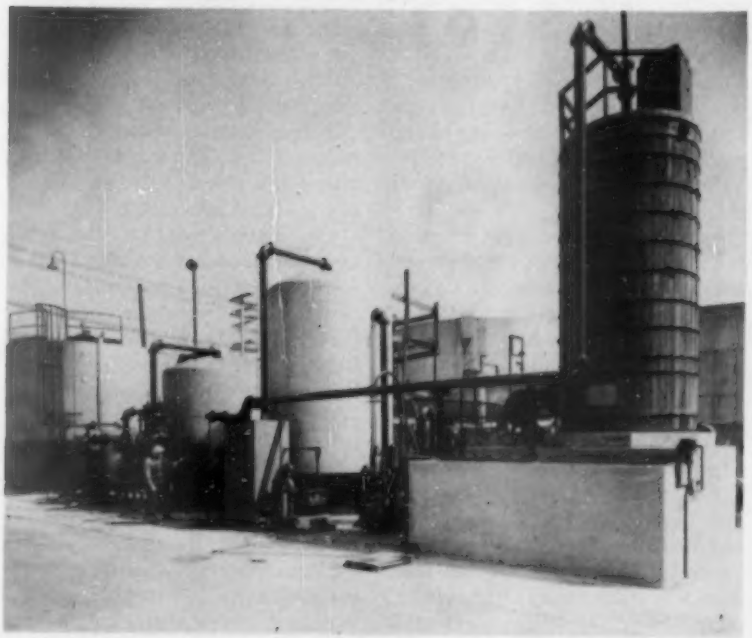
Coagulation is effected by adding to the water a substance known as a coagulant. This substance reacts chemically with the natural alkalinity of the water, or with added lime or alkalies, to produce a gelatinous precipitate. The precipitate attracts, enmeshes, or adsorbs the turbidity or color, thus produces larger aggregations known as "floc." The floc may be removed by settling and filtration.

For efficient coagulation, the pH value of the water must be kept within a certain range. The optimum pH value for each surface water supply is best determined locally. The waters that coagulate most readily are those that are consistent in showing considerable amounts of turbidity and also contain large amounts of dissolved mineral matter. Waters that are high in color and low in turbidity and dissolved mineral matter are the hardest to coagulate.

Proper mechanical agitation is also of great importance in forming a tough and easily settled floc. Variable speed agitators are valuable in this connection because speed of agitation can be readily adjusted to obtain the best flocculation under all conditions. Correct agitation also broadens the range of pH values under which good coagulation may be obtained. And it effects notable savings in the quantities of chemicals used.

Chemical feeders—They feed accurately measured and easily adjusted doses of coagulants or other materials to the water that's being treated. Broadly, they are of two types — wet and dry. In the wet feeder the chemical is fed in the form of an aqueous solution or in suspension. In the dry feeder, the chemical is fed in dry form. Both these types are further classified into constant-rate and proportionating types. The former is used when the water to be treated flows at a constant rate. It's connected so the feeding starts and stop simultaneously with the starting and stopping of the flow of water. The proportionating feeder is used when the flow of water to be treated varies. The feeding of the chemical varies proportionately with the flow rates of the raw water.

Settling—Tanks (or basins) are used for two purposes: to provide a sufficient detention period that permits coagulation reactions to go to completion with the formation of a large, tough floc; and to settle out the bulk of the floc, thus relieving the load on the filters and permitting much longer filtration runs



HYDROGEN CATION EXCHANGER (left center) and sodium cation exchanger (center) operating together remove hardness and reduce alkalinity to degree required. A forced-draft degasifier (right) is mounted above a catch basin.

between cleaning of filters by backwashings. Settling tanks are made of wood or steel and are usually above ground level. Settling basins are made of concrete and are usually partly or completely under ground level. Baffles avoid short-circuiting, just as they do in sedimentation tanks.

Floc-formers—These are a later development. One is shown in a photo on p. 128. In this installation the compartments are on the left-hand side, the settling basin on the right. As the raw water enters the first chamber of the floc-former, it's mixed with the chemicals from the chemical feeders. These may be situated either at ground level (with the chemicals pumped to the floc-former) or on top of the floc-former (with the chemicals discharged directly into it).

The treated water then flows successively through the other floc-former chambers, each of which is fitted with agitators rotating at a speed that's controlled to provide a gently agitated rolling mix. This forms a large, tough, and easily settled floc. From the last of the floc-former compartments the coagulated water enters a baffled settling basin. There the bulk of the floc, plus its load of entrained turbidity and color, settles to the bottom. From there it's discharged through a sludge removal system. Final clarification of water is effected in filters, following treatment in the settling basin.

Precipitators—These, known also as the sludge-blanket type of clarifier, are the newest development in coagulation and settling equipment. A unit consists basically of an inverted V-section in a tank. The influent traces a path from its entry into the neck of the V downward and outward and up the outside of the V to the top. There it's drawn off by overflow weirs. Water and chemicals are thoroughly mixed in the upper part of the inner V-section, and a large, tough floc is produced by controlled agitation as water passes downward through it.

As the water emerges from the bottom of this inner section and rises through the outer section to the draw-off troughs, it is settled and filtered through a predetermined depth of previously formed sludge. Because of the increasing cross-sectional area of this outer section, the vertical velocity of the rising water constantly diminishes until it reaches a plane at which its velocity is so low that it leaves the sludge behind. In practice this is found to constitute a clean plane of demarcation between the sludge and the settled water.

Because of the intimate contact of the water with precipitates afforded in this type of equipment, the maximum adsorbtive and straining effect of the floc is fully utilized. While the detention periods in the old types of settling tanks and basins were usually from 4 to 6 hours, in the precipitator the time usually runs only 60 to 70 minutes. Therefore the ground space occupied by the precipitator need be only a fraction of that required for the older types of equipment. For instance, one precipitator installation takes up only a small land area, but handles over 8½-million gallons of turbid and highly colored river water per day.

Filtration—Final clarification of the coagulated, or coagulated and settled water, is usually done in sand filters. The most common filter medium is sand, but crushed and graded anthracite is also widely used. There are two main types of filters—pressure type and gravity type. In the pressure type the container for the filter media is a closed steel shell. In the gravity type, it's an open shell of concrete, wood, or steel.

. . . *Pressure-type*. These come in both vertical and horizontal design. Vertical filters are made in a range of sizes from 18 inches to 10 feet in diameter. Horizontal filters are usually 8 feet in diameter and range in length up to 25 feet. At the bottom of the tank is an under-drain system. It serves a double purpose —as a collector for the filtered water on the filter run, and as a distributor for the backwash water whenever the filter unit is cleaned by backwashing. On top of this underdrain system are several layers of graded gravel. The coarsest is at the bottom, the finest at the top. A layer of coarse sand follows, then fine filter sand.

During filtration the water under pressure enters the upper part of the filter through a distributor, slowly passes down through the various layers of filter sand and gravel, then into the underdrain system, from which it flows into service. As filtration proceeds, the layer of coagulated matter that collects in the filter grows thicker and exerts an increasing resistance to the flow of water.

And when this pressure differential reaches some 5 to 8 pounds per square inch, the filter unit is cut out of service and backwashed.

Backwashing is performed by sending a strong stream of water through the underdrain system, upward through the gravel and sand layers, and out to the drain. After backwashing for about 10 minutes, the filter unit is then rinsed (flow to waste) for a few minutes so as to settle the bed and build up a small layer of coagulated matter on and in the upper layers of the filter sand. Then the unit is returned to service.

. . . *Gravity-type*. Although wood and steel shells are sometimes used for gravity filters, the shell usually is made of concrete in the form of a rectangular box. Gravity filter units are invariably mounted so as to discharge into a clear well, from which the water is pumped to service. The well also serves to supply filtered water for backwashing. Although the gravity filter differs in design details from pressure filters, the principles, the methods of operation, and the results are much the same. Backwashing is needed, however, after a much lower pressure differential has been built up.

Coagulation, settling, and filtration—when properly carried out—will remove turbidity, color, colloidal suspensions, organic iron, or manganese. They will also effect large reductions in micro-organisms. But won't remove soluble mineral matter. So the hardness content of a water is just as great after filtration as before.

Taste and odor removal—Aeration usually is effective in reducing odors, though it may not remove them completely. Therefore it may be followed by treatment with activated carbon. Where coagulation and settling is the practice, powdered activated carbon is added as water enters the coagulation and settling

equipment. And here's another way to do it:

Pass the water through filters in which a granular activated carbon is the filter bed. This is like the pressure sand filter with sand replaced by activated carbon.

Because the taste- and odor-producing substances in water are usually minute in quantity, and because the absorbent capacity of activated carbon is large, an activated carbon filter remains active for a long period of time. It is considered good practice to remove and replace the bed at least every year if the absorbent capacity has not become exhausted.

How to treat clarified waters

Chlorination—By far the most widely used disinfectant or sterilizing agent for water is chlorine. It kills various micro-organisms—bacteria, algae, slimes, iron and manganese bacteria, molds, and so on. It also oxidizes sulfide residuals, iron, and manganese. And it's valuable as a bleach for some high-color waters. Strangely, when certain organic materials are present, chlorination with only slight residual (excess) may greatly accent the taste or odor, while superchlorination may destroy it.

When large quantities of water are handled, liquefied chlorine gas is the most economical material to use. It comes in pressure cylinders and is fed directly into the water from a chlorinator. For smaller volumes of water, a hypochlorite solution may be used. This may be fed from a hypochlorinator or a lime or alkali feeder.

Chlorine dioxide is also used to a certain extent in water treatment. It's made, in solution, by feeding chlorine into a solution of sodium chlorite.

Aeration—It's used for several purposes. Various designs of aerators are available. And here's what they'll accomplish:

. . . Remove free carbon dioxide.

. . . Oxidize soluble iron or manganese to insoluble hydrated oxides (solids).

. . . Reduce the sulfide content of a sulfur water.

. . . Remove or reduce tastes or odors.

For the first two purposes above, the coke-tray type aerator (see photo, page 128) is widely used. This type usually has three trays placed one above another, with air spaces between them. On each tray is a layer of coke. The water rains down through these trays to a catch basin underneath.

For removing large quantities of carbon dioxide, the forced-draft counter-current degasifier is especially efficient. It's also used for the reduction of hydrogen sulfide and the oxidation of iron and manganese. This type uses a tall, vertical, cylindrical or rectangular tank into the top of which raw water is admitted. As the water gravitates downward, its flow is evenly distributed over the area by a distributor tray, from which it rains down over a series of wood slat trays. A current of air is blown upward through the degasifier and discharged from vents in the top. Other aerators available are: wood-slat tray type, riffled cone type, step type, and spray type.

Deaeration—It removes dissolved air and carbon dioxide from water. This corrects the corrosive tendencies of the water.

The solubility of oxygen, nitrogen, and carbon dioxide in water is zero at the boiling point of water. So these gases may be removed from water by boiling it. If the deaeration of boiler feed water is involved, then the boiling is done at atmospheric pressure or slightly above — that is, at or above 212 F. For low-pressure boilers, a spray heater or some other design of single-pass heater is sufficient. For high-pressure boilers, the water is not only heated to the boiling point. It's also scrubbed with steam. In this type of deaerator, the steam is used twice. First it's blown through the hot water coming from the spray heater. Then used in the spray heater. The liberated gases are vented to the atmosphere through a vent or a vent condenser.

If cold water is to be deaerated to protect long mains or cooling systems from corrosion, then the boiling is done at ordinary water temperatures in a vacuum. The deaerators used for this purpose are called vacuum deaerators. Steam injectors are usually used to draw the required vacuum and vent off the liberated gases.

Chemical inhibitors — Several chemical methods for inhibiting corrosion in plant pipelines and equipment are being used successfully. In steam boilers, sodium sulfite is used to react with and remove residual oxygen resulting from incomplete deaeration. Another new material of great promise is hydrazine. And the pH value of condensed water can be raised with an alkaline material. Corrosion in return lines may be inhibited by using a neutralizing or filming amine.

Internal treatment with chemical additives is also useful — either as the sole treatment needed for low-pressure boiler feedwater or as an additional treatment with pre-softened feedwater. Sodium phosphate is widely used to react with any residual hardness (from hot lime-soda water softening) or any other hardness introduced accidentally by condenser leakage. Other materials are quebracho, tannin, and simliar organic materials. These are often mixed with phosphate, soda ash, and other ingredients to form prepared boiler compounds.

Both hot and cold service water lines, cooling jackets, and the like will show greatly reduced corrosion rates if protective films are provided over the surfaces in contact with water. To this end, many process water lines (but not boiler feed lines) are protected by feeding caustic silicate to the water. The amounts required are quite small—about 0.1 pound of 40-degree Be sodium silicate (common water glass) per 1000 gallons of water, plus enough caustic soda to bring the pH value up to about 8.3.

Another method — used with some cooling waters and other waters that don't require complete softening — is to treat the water so it will form a thin film of calcium carbonate scale on the metal.

A third method of building up pH and reducing the corrosion rate (when volumes of water are not large) is to pass the water through a neutralizing filter. The filter contains a bed of crushed and graded calcite. When water with a low pH comes in contact with the bed, enough calcite dissolves to raise pH to 7.2 or 7.3, at which point action ceases.

Turn the page

Iron and manganese removal — When present as soluble bicarbonates, these may be removed by:

. . . *Aeration, settling, filtration.*

. . . *Zeolite softener.*

. . . *Filtration through manganese zeolite.*

In the first method, water is first passed through an aerator where sufficient air is dissolved to oxidize the iron or manganese. The great bulk of the insoluble hydrated oxides settles in the catch basin. Passage through a filter removes the remainder. For iron, it's sometimes necessary to add alkali or lime to the aerated water in order to speed up the reaction. It's always necessary to add one of these if you want to get rid of manganese.

The second method is of value only when the water is to be completely softened by the zeolite process. In that event, iron or manganese impurity is removed by the zeolite simultaneously with the removal of the hardness.

The third method is best used only with waters containing 1 ppm. or less of iron or manganese. The water is passed downward through a bed of manganese zeolite, which oxidizes the iron or manganese to form insoluble hydrated oxides. These are removed by the filtering action of the bed. The accumulation of oxides is removed by periodic backwashings. The oxidizing power of bed is restored by regeneration with potassium permanganate.

The above three methods are for ground waters. But none of them will work for organic or colloidal forms of iron or manganese, which may occur in surface waters. These forms can be removed by careful coagulation, settling, and filtration. And in acid waters, iron and manganese may be removed by neutralization with lime or alkali, aeration, settling, and filtration.

Silica removal—Can be done by cold lime-soda or hot lime-soda magnesia process (see next two columns), distillation (next page), or demineralization (p. 134) processes. Coagulation of raw waters with ferric sulfate will also reduce silica content. But dosages required are large and the process increases total solids content of the water.

Softening: cold lime-soda process —Done by precipitation. The chemicals (lime, or lime and soda ash) are added to the cold water. They react with the hardness constituents, form precipitates that are removed by settling or settling and filtration. Amounts of chemicals used depend on results required. For instance, if only the calcium bicarbonate is to be reduced, then you add just enough lime to do the job. If magnesium reduction also is required, add more lime. If non-carbonate hardness is to be reduced, add soda ash also.

A coagulant (it's usually sulfate of alumina) is used to help settle the precipitates. The sludge produced consists mostly of calcium carbonate or calcium carbonate and magnesium hydroxide. This process may be carried out in any of three types of equipment: settling tank or basin, precipitator sludge-blanket, or (within certain limits) catalytic.

. . . *Sludge-blanket* (see also "Precipitators," page 130) is now widely used because it requires less space and a shorter detention period. Also, it eliminates "after-deposit" in filters and pipelines. The extent of hardness removed, without using an excess of chemicals, is up to about 4 or 5 grains per gallon. With excess chemicals, the hardness may be reduced to 1 grain per gallon.

Silica removal is accomplished in this process by the use of dolomitic lime or activated magnesia. Increase of temperature greatly increases efficiency. The highest efficiency is reached in the hot lime-soda magnesia process.

. . . *Catalytic.* This equipment consists of an inverted conical tank about two-thirds filled with a bed of catalyst. This may be finely granular calcite, sand, or greensand fines (diameter 0.3 to 0.6 mm.). The raw water and added chemicals enter at the bottom neck of the V and mix as they swirl upwardly through the suspended catalyst. The calcium carbonate then deposits on the granules in successive coatings, causing them to grow. Detention period is only 8 to 12 minutes. But the process is usually limited to the removal of calcium only—and from waters with temperature of 50 F. or higher.

Softening: hot lime-soda process —The water is first heated to temperatures at or near the boiling point, treated with the required dosages of hydrated lime and soda ash, then settled, and finally filtered. The lime and soda ash react with the hardness constituents to precipitate the calcium and magnesium in the raw water (plus the added lime) as a sludge consisting of calcium carbonate, magnesium hydroxide.

In this process a 2-grain per gallon excess of chemicals will yield an effluent with a total calcium and magnesium hardness of less than 1½ grains per gallon. But since it costs money to heat the water, the lime-soda process is limited to applications where water must be used hot anyhow — such as for boiler feedwaters and the Frasch sulfur mining process.

The equipment used consists of four elements: primary heater, chemical feeds, settling tank, and filters. A fifth element—a deaerating heater—is added if dissolved oxygen content of less than 0.01 millimeter per liter is required. The deaeration taking place in the primary heater is sufficient to lower the dissolved oxygen from saturation limits down to less than 0.3 millimeter per liter. The chemicals are fed in proportion to the hardness and flow of water.

Filters are of the closed, pressure type, with a non-siliceous filter medium. The reason for using non-siliceous material in place of the customary sand and gravel is to eliminate all danger of silica pick-up by the hot alkaline effluent of the settling tank. Backwashing is done with hot settled water rather than with cold raw water—to avoid wastage of softened water, chemicals, and heat units, and to prevent clogging deposits in the filter medium. The filters are usually installed in batteries of two or more units. They're so designed that when one unit is out for backwashing, the other unit—or units—can carry the full load.

. . . *Two stage hot lime-soda phosphate process.* The effluent from the hot lime-soda water softener (when the usual excess of soda ash is used) is a little less than 1½ grains per gallon in hardness. By giving the settled water from the hot lime-soda water softener a sec-

ond-stage treatment with phosphate, this residual hardness can be reduced to not over 2 ppm.—less than ⅛ grain per gallon.

. . . *Two-stage hot lime sodium cation exchanger process.* In this process the water is first treated with lime in the hot lime water softener. Second, the filtered effluent from the hot lime treatment is passed through a sodium cation exchanger of the resin type. This softens the water to practically zero hardness.

Softening: zeolite, or sodium cation exchanger process — This may be either one of two types: pressure or gravity. Since the pressure type is almost universally used in industries, only this type will be described here.

The softener consists of a steel shell, designed so as to withstand any pressure encountered. The shell holds a bed of granular or bead-like zeolite (sodium cation exchanger). This is supported by several layers of graded gravel lying over an underdrain or collector system. The water is admitted to the upper portion of the shell and uniformly distributed over the surface of the zeolite bed. It then passes evenly downward through the bed. During this passage the elements that form hardness—calcium and magnesium —are removed by the cation exchanging action of the zeolite and are replaced by sodium. This removal is so complete that the effluent is known as "water of zero hardness" or — more commonly — as "zero water." If soluble iron or manganese is present in the raw water, it also is removed.

The softened water then passes through the supporting layers of gravel and the collector system to the outlet and through the meter to the service lines. In zeolite water softeners that are operated by hand, the hand on the meter is set for the predetermined quantity of water that the unit will completely soften. At the end of the softening run (indicated when the hand on the meter returns to the zero point, or when an electric alarm bell sounds, or a signal light flashes) the unit is taken out of service, regenerated, and restored to service. These softening runs range from 4 hours to over 24 hours in length, depending on the type of zeolite and water hardness.

Regeneration time for a unit runs from 30 minutes to one hour. There are three steps in regeneration, as follows:

. . . *Backwashing.* This is done by passing a strong stream of water upward through the softener. It loosens and regrades the zeolite bed, suspends it, and removes any dirt collected on the top of the bed during the softening run.

. . . *Salting.* A built-in hydraulic ejector injects a predetermined quantity of a solution of common salt. As the solution passes down evenly through the bed, the salt reacts with the zeolite, thus removing the calcium and the magnesium in the form of their very soluble chlorides and—at the same time—restoring the zeolite to its original active sodium condition.

. . . *Rinsing.* This last step consists of washing the calcium and magnesium chlorides, in addition to the excess salt, to the drain. This is done by means of a downward flow of the rinsing water. After the rinse, the softener unit is returned to service.

Zeolite water softeners are sometimes regenerated with sea water. Operating costs are extremely low for this type of regeneration because all that's involved is coagulation, filtration, and chlorination of the sea water, plus pumping costs. One plant softened a 60-grain per gallon hardness for less than 1 cent for 1000 gallons. Another softened a 20-grain water for 0.3 cent per 1000 gallons. Distances from sea water to the plants involved ran up to 5 miles. Some oil-field brines or connate waters (fossil seas) of proper salinity and composition are also used for the same purpose.

To insure uninterrupted soft-water service, zeolite water softeners are usually supplied in batteries of two or more units. They are so designed and operated that while one unit is being regenerated the other unit or units are able to handle the full softening load. In other installations, soft-water storage tanks are used to tide units over the regeneration periods. Completely automatic zeolite water softeners are available. In these units, a motor-driven multiport valve coupled with electrical controls serves to perform all the operations formerly done by hand.

Softening: hydrogen cation exchanger process—This type of water softener is different from the sodium cation exchanger water softener in three ways. It not only removes calcium and magnesium, but also sodium. It exchanges hydrogen cations instead of sodium cations. And it is regenerated with acid instead of salt. But while inorganic as well as organic cation exchangers may be used on the sodium cycle only the organic can be used on the hydrogen cycle.

The hydrogen cation exchanger has several advantages over the sodium cation exchanger. One advantage already mentioned is that it removes sodium as well as calcium and magnesium. Another is that it removes the alkalinity from water, whether it's due to bicarbonate hardness or sodium bicarbonate. Also it reduces the total solids content of the water by an amount equivalent to the bicarbonate alkalinity. Finally, it may be used as the first step in removing all the mineral matter from water.

The hydrogen cation exchanger water softener resembles the zeolite or sodium cation exchanger water softener. But there are several modifications, because everything must be acidproof. The effluent from a hydrogen cation exchanger unit is usually acid. Before use, this acidity must be neutralized either by feeding soda ash or caustic soda to the effluent, or by the use of both hydrogen and sodium cation exchangers. In this hook-up the volumes of the two effluents are in such proportions that the alkalinity of the sodium cation exchanger effluent neutralizes the acidity of the hydrogen cation exchanger effluent and provides the excess alkalinity that is required.

Distillation—There are many industrial processes and applications that require a water free from mineral matter as well as hardness. Such a water may be obtained either by distillation or by demineralization by ion exchange. Either of these processes yields water of excellent quality. Therefore the choice of which process to use depends on other factors—but mainly on operating cost.

With most fresh waters the costs of distillation are usually much higher than those of demineraliza-

tion. The highest costs are encountered in a single-effect (one-stage) evaporator. These costs usually range from $8 to over $10 per 1000 gallons. Double-effect (two-stage) evaporators will cut these figures not quite in half. And quadruple-effect (four-stage) evaporators will lower them to $2 to $3 per 1000 gallons.

Large compression-type stills may cut these costs still further. In this type, with compression of the steam coming from the boiling chamber and with condensation of the steam in a coil in the boiling chamber, the latent heat given off by the condensation is used to boil a fresh portion of the water.

The costs cited above are for process water. In high-pressure boiler plants with very small amounts of make-up, the costs are lower.

Since distillation is such an old process it need not be described in detail except to say that the stills are known as evaporators. They are available in such designs as to provide up to quintuple effects. But for process uses, most of them are of the single- or double-effect type.

Demineralization—Demineralization by ion exchange is done by a hydrogen cation exchanger followed by an anion exchanger. There are several hook-ups, with and without a degasifier.

The anion exchanger may be of the weakly basic or strongly basic type. The weakly basic type will remove only strong acids, such as sulfuric and hydrochloric. It may be regenerated either with soda ash or with caustic soda. The strongly basic type will remove not only the strong acids but all acids, including such exceedingly weak acids as carbonic and silicic. It must be regenerated with caustic soda.

The costs of demineralization by ion exchange are for the regenerants used and for wear and tear on the ion exchangers. For most fresh waters this will range from around 3 cents to somewhat over 60 cents per 1000 gallons. Because of these comparatively low operating costs, demineralization by ion exchange is coming into widespread use in industry. It makes possible a water equal to distilled water at only a small fraction of the costs of distillation. Demineralization costs rise, however, with the increasing mineral contents of the raw water, while the distillation costs rise but slightly. Therefore, for highly saline waters, distillation is the only practicable and economical process for freeing them from mineral matter.

The most widely used hook-up is the two-step arrangement with degasifier. It consists of a hydrogen cation exchanger unit, a degasifier, and an anion exchanger unit.

Another hook-up often used when the bicarbonate content of the water is relatively low, is the two-step arrangement without degasifier. Except for the omission of the degasifier, this is similar to the first-mentioned hook-up.

If there are appreciable quantities of sodium sulfate or sodium chloride in the raw water, there is a tendency in single-pass treatment for a small amount to slip through the hydrogen cation exchanger. There are several ways of overcoming this. But the ones most widely used are four-step with degasifier, mixed-bed unit, and hydrogen cation exchanger and mixed-bed unit with degasifier.

. . . *Four-step with degasifier.* The flow at first is through hydrogen cation exchanger, degasifier, anion exchanger, hydrogen cation exchanger, and anion exchanger. When the first two units are exhausted, the slightly used beds in the last two units are used, with the degasifier between. And after the regeneration of the first two units has been completed, they become the last two units in the hook-up until the others require regeneration, when they once again become the first two units.

. . . *Mixed-bed.* In this operation, both the hydrogen cation exchanger and the anion exchanger are in one shell and are thoroughly mixed before the demineralization run. This mixing is generally accomplished by means of a current of air that is displaced by water before the run begins.

But at the end of the demineralization run, the anion exchanger and cation exchanger are hydraulically separated by backwashing. The anion exchanger, having a lower specific gravity, lies on top of the cation exchanger layer. While thus separated, they are separately regenerated and rinsed, and then mixed before the next run is started. The advantage of this method of operation is this: The mixed bed, as a battery composed of many thousands of alternating cation and anion exchangers, insures a very complete removal of the mineral matter. The disadvantage, however, is a higher operating cost.

. . . *Hydrogen cation exchanger and mixed-bed with degasifier,* This method is much more economical in operating costs because it removes by aeration the great bulk of the carbon dioxide formed in the hydrogen cation exchanger instead of leaving it to be removed in the anion exchanger. In this hook-up the water passes first through hydrogen cation exchanger units, then through a degasifier to a catch basin, from which it is pumped through mixed-bed units.

NOW — A FAST SUMMARY

Harmful impurities in water may be removed by the right treatment, thus save the cost of treatment through higher product quality and lower operating and maintenance costs. Here's what you can remove —and how you can do it:

. . . *Sediment, turbidity, and color.* By sedimentation, coagulation, settling, and filtration.

. . . *Tastes and odors.* By aeration and activated carbon.

. . . *Micro-organisms.* By treatment with chlorine.

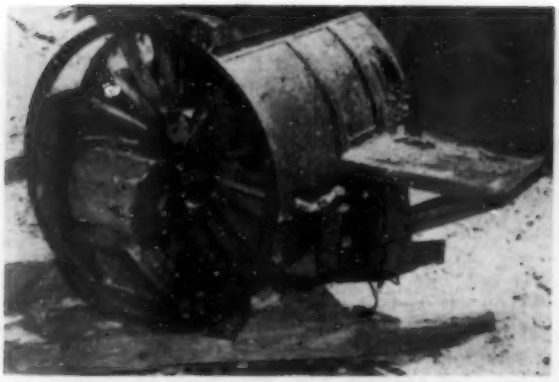
. . . *Soluble iron and manganese.* By aeration, settling, and filtration; or by manganese zeolite; or by a cation exchanger.

. . . *Organic iron and manganese.* By coagulation, settling, and filtration of the elements.

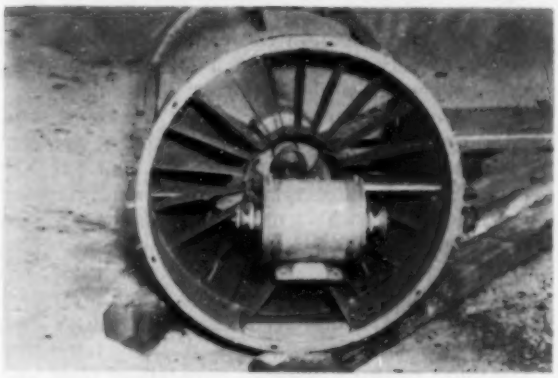
. . . *Silica.* Reduction with magnesia in either the hot or the cold lime-soda process; removal by demineralization or distillation.

. . . *Dissolved gases.* By deaeration (for oxygen); by aeration or deaeration (for carbon dioxide); and by aeration, special degasification, or chlorination (for hydrogen sulfide).

. . . *Hardness.* Reduced by one of several processes—cold or hot lime-soda, zeolite (sodium cation exchanger), or hydrogen cation exchanger. Removed by demineralization or distillation.



CORROSION did this. Caused by starchy weave-room lint that clings to fan and casing, eats holes bigger than a fist.



RECONDITIONED FAN is good as new—holes patched with plastic cloth, blades and vanes lined to resist corrosion.

FORM-FITTING repair of fan casing with plastic cloth is simple. And one coat of paint boosts weatherproofing.

These Patches Will Stay Put

New plastic cloth (plus scissors) is all you need to patch holes in metal, wood, or fiber. Stops corrosion, too. And will outlast what you've patched.

BETTER THINK twice before junking anything like the fan in the picture (upper left). Maintenance men at The Springs Cotton Mills, Lancaster, S. C., are patching rust holes in ductwork and casings large enough for a cat to slither through. They use plastic-impregnated cloth, called Celastic. (Product of The Celastic Corporation. Sole industrial distributors: Calahan & Horsey, Inc., New York City.) It makes a good protective lining, too.

Corrosion of equipment that works in humid areas (85% or higher) or handles humid air has long been a problem in Lancaster cotton-weaving operations. Now, plastic cloth does the trick. Here's how:

. . . Ductwork for humid air. Copper is needed for the duct barrel. But it's too soft for the duct head, which contains the fan. So Springs uses black iron. Before using Celastic, heads rusted through. Now holes are patched with plastic cloth. Saves equipment. And cuts down repair time and costs.

. . . . Fan casings in evaporative cooling systems. You can see the damage (upper left photo). Weave-room lint clings to the fan, changes from neutral to acid, then swings to alkaline. That way, steel and aluminum deteriorate fast. But now Celastic lines fan surfaces, prevents corrosion, erosion. And patches holes in untreated units that come back for repairs.

. . . Steel motor casings. They used to rust. But now they're waterproofed with Celastic.

Easy to apply—Celastic comes in rolls or sheets—various sizes. Handles like blotting paper. *Instructions:* Clean surface to be repaired. Immerse cloth in liquid activator (called BBX). Press saturated cloth on, smooth it. No special skill needed. Cloth will follow any surface contour. Quickly becomes tacky, leathery, then hard and inseparable, resistant to corrosion and abrasion in temperatures from –60 to 200 F. Coat of paint enhances weatherproof, waterproof qualities.

Base material must not be too thin. On a less than solid base, you can't smooth the material on hard enough for a good bond.

FACTORY | HUMAN RELATIONS

By LESTER R. BITTEL, Industrial Management Editor, FACTORY

Getting That Extra Spark

Tyrus Raymond Cobb, on his 68th birthday last month, commented on the trend among modern baseball managers to signal the batter on every pitch. Ty, baseball's greatest individualist, said:

"It takes something out of a man to have his manager tell him to take or hit. How can he have any real spark if he has to look to someone else to tell him what to do?"

That's a provocative question for any manager—whether your team is in contention for a major league pennant or just plugging like mad at Mudville Mulch & Mower Company to meet this month's delivery schedule.

In business as well as baseball, if you want to preserve your subordinates' initiative, you'll have to give them a chance to make their own decisions. That way you'll be able to take advantage of that extra spark that marks the champions.

Wooing New Employees

An ad in the Help Wanted section of *The New York Times*: "They listen to your ideas at National."

How's that for a unique way to appeal to job applicants? In this case, National Company, Inc., Malden, Mass., was trying to attract engineers. But it shows the growing recognition by smart employers that employees want to find a receptive ear for suggestions about their work.

Three New Books You'll Want

Here are three new booklets on health—one *you* ought to have and two for your employees. For the latest, complete rundown on the cause, care, and prevention of dermatosis, get *The Prevention of Occupational Skin Diseases*. It's written by Dr. Louis Schwartz, retired medical director of the U.S. Public Health Service. Single copies are free from the Association of American Soap and Glycerine Producers, Inc., 295 Madison Ave., New York 17.

Two physical conditions that your employees either worry too much about, or not enough, are arthritis and rheumatism—and care of the eyes. The Arthritis & Rheumatism Foundation, 23 West 45th St., New York 36, puts out a folder—*Arthritis*—that quickly tells workers the facts. It tells the "do's" and "don't's" about this crippling disease that is affecting "more than 17% of all factory workers, plus 558,000 craftsmen and foremen, and 441,000 managers and company officials." Quantity copies are about 1½¢ each—from the Foundation.

How's Your Eye-Q? is the name of a pamphlet OK'd by National Vision Institute. It describes four simple tests you can perform to determine whether your vision is faulty. And includes warnings and tips about eye diseases, cataracts, watching television, and effect of strong sunlight. Also tells in plain language when to consult an oculist, optometrist, or optician. Copies in lots of 100 cost 8½¢ each. Write Good Reading Rack Service, Inc., 76 Ninth Ave., New York 11.

Communications Grows Up

Time was when anyone mentioned communications, plant operating executives looked around for the telephone or the telegraph key. But developments in the last few years have changed this mechanical conception to a better understanding of the "interchange of thoughts and opinions." That quote is from Webster, and it pretty simply states what people are trying to do with communications in industry. Here are just a few examples of the way the word—and the idea—have caught on:

. . . *General Electric Company* has a communications department with 7 staff consultants who counsel the various G-E plants on their plant and community

relations problems. And General Foods Corporation, White Plains, and Chrysler Corporation, Detroit (to cite just two more examples), have recently added communications departments to their organization.

. . . *American Management Association* has a course in Executive Communications (given 9 times a year). It has tripled its registration since its beginning last February.

. . . *Two leading universities*—Lehigh at Bethlehem, Pa., and the University of Southern California, Los Angeles—are giving degree courses on the subject. Lehigh has a two-semester course leading to a degree major in *Communications in Industry*. USC has a *Division of Communications* with courses leading to AB, AM, and PhD degrees.

So it looks as if the drive for better communications in industry is no fad. It's a real need and one that will require more and more of your attention and effort.

Try a Poster Contest

People just naturally like contests. And now here's one that combines competitive appeal with a chance for self-expression. Pittsburgh Plate Glass Company sponsors a poster-writing contest for its employees. It awards a $25 bond each month to the winner. And uses the winning idea in its company-wide bulletin board program.

Eligible topics cover good housekeeping, avoiding waste, absenteeism, progress, teamwork, productivity, and security. It seems like a good way to get workers thinking constructively on these subjects. And it shows how you can broaden a basically sound idea —like the slogan contest—to cover a wider range of interests.

Screening for Honesty

There's no need now to make job applicants take a lie detector test. A new employment questionnaire provides 116 key questions that indicate the applicant's reliability. That's the claim of the "honesty evaluator," or Reid Report, published by John E. Reid & Associates, 600 S. Michigan Ave., Chicago 5.

Form was designed primarily to appraise trustworthiness of applicants for jobs where there is opportunity to steal. It's not intended for persons already on the job. Has limitations in union shops where it's difficult to tell whether a worker will end up in tool crib, stockroom, or shipping department.

Developed by a "lie-detector" expert, form has 158 questions, 42 of which are similar to those on an ordinary employment blank. Its reliability has been checked against 2650 applicants in 48 Chicago area firms. In each case, answers were correlated against follow-up tests made by polygraph lie-detector techniques. Biggest asset is that form is *predictive*—not merely a means of determining past behavior.

Reid says that the form must be filled out in the presence of one of his examiners, either at your plant or at one of his offices (Chicago, Pittsburgh, San Francisco, and New York). An evaluation can be made the same day. Cost is $10 per applicant.

Versatile Display Case

There's a growing trend for companies to exhibit their products in the visitors' lobby, or in clock-alleys and employee entrances. It's a fine idea, but it's not always easy to create the type of showcase that sets exhibits off to an advantage. That's why you may be interested in a packaged display unit now on the market. It's 3 by 4 feet by 12 inches deep, fitted with a pegboard panel, and concealed fluorescent light. All for $125. Manufacturer: Ohio Displays, 2206 West Superior Ave., Cleveland 13.

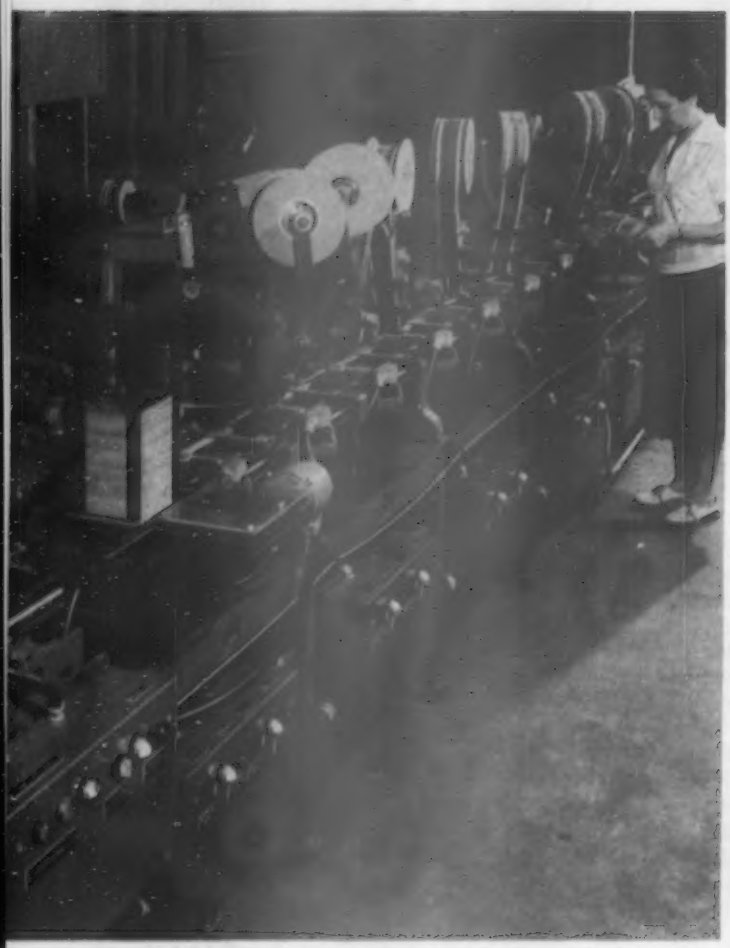
Workers Paid for Saving

Is it the policy of your plant to try to keep its benefit program up with the "Joneses" of industry? Then try matching Du Pont Company's latest. For every dollar an employee saves each month in U.S. Savings Bonds, the company puts 25¢ into trust. Money will be used to buy Du Pont common stock for him.

This "one-for-four" program aims at encouraging sustained savings. An employee's bonds will be held in trust for four years after he joins the plan. Those bought the first year are then delivered to him, and one year's purchase is delivered annually thereafter. Likewise stock is held for four years. Then shares are turned over to employee after they have been registered in his name for two years.

Savings are made through payroll deduction. Minimum is $12.50; maximum, $37.50. So far 73% of Du Pont's 100,000 employees participate. Plan is voluntary, open to employees with two years' service.

Automated assembly



IN AUTOMATED LINE (partly shown here) assembly heads insert parts precisely in printed boards, clinch them firmly in place.

AT START of line, board is inserted in transport pallet. Empty pallet returns from chute (right).

AT END of line, ejector removes board from pallet. Empty pallet drops down, returns to start.

How Automation Hits a Plant

Back of Emerson's automated assembly and soldering machines (see photos) we find a chain reaction (page 140) that spreads to every department of the plant.

PICK YOUR TOUGHEST production problem. Think automation won't solve it? Don't you believe it. For years we at Emerson (like the rest of the radio and TV industry) have been plagued with the detailed hand assembly, wiring, and soldering of the maze of components that make up a circuit. Now, with equipment like that shown in the pictures above, we can assemble our circuits automatically. It's "no-hands" work.

By MARTIN RICHMOND, Supervisor
Standards and Plant Layout
Emerson Radio & Phonograph Corp.
Jersey City, N. J.

The system was developed in conjunction with United Shoe Machinery Corporation—using its "Dynasert" assembler. The equipment inserts electronic components and wires into holes in printed wiring boards, then clinches them in place. Attachments made by Malco Tool & Manufacturing Company can insert the terminals. Afterwards, connections are permanently dip-soldered on the automatic soldering machine (photo, opposite page)—which we developed at Emerson.

The assembly equipment consists

HOW AUTOMATION HIT EMERSON . . . *Begins on page 138*

our key mechanics to production.

Automated dip soldering

BIG DIP solders 150 joints at a time. Endless chain drags chassis past fluxing brushes, over pot. Cam controls dipping angle—one key to success of this machine. Used to take a dozen girls to turn out the same amount of work.

of a series of 30 assembly heads that operate in a single, controlled assembly line. Each head is designed to attach a certain type of component. There are heads for different-size resistors, capacitors, jumper wires, tube sockets, coils.

Wiring boards move automatically on special pallets from station to station in a three-second cycle. They're picked up by pallets and removed from pallets automatically. And the pallet returns automatically on a belt from the end of the line to the beginning. The pallet ensures accurate positioning of the board during assembly, so that leads line up with insertion holes. The equipment is of modular design. That means any number of stations can be used. Some day, similar equipment may be used by other industries because heads can be mounted in positions other than vertical if needed for a different kind of assembly job.

Each assembly head must perform some or all of the following operations: Feed the component into the machine, orient the component, prepare the component, insert it through the holes in the board, and secure the component. To justify the high investment in the equipment, we apply certain economic considerations—learned from experience—when we select heads. For example, each head should be capable of . . .

. . . *Assembling* most of the boards scheduled to run through the line.

. . . *Changing* the physical shape or size of the component by cutting, forming, or clinching leads.

. . . *Untangling* or orienting parts, even from hard-to-handle packages. Or be the only practicable way of assembling a part.

The automatic dip-soldering machine (photo above) completes up to 150 joints in one shot. Only one operator is needed to load and unload it. By conventional methods, 12 operators would be needed to solder the same number of joints—to produce 1000 units per day. The speed of the machine can be adjusted to change the dipping time. The cam action tilts the board as it dips, thus makes the process work.

Now, to learn about automation's impact on other plant departments . . .

. . . Turn the page

struction costs over a period of

Chain reaction through the plant

Automation's impact, fanning out from our installation of automated circuit assembly, has hit many other sections of manufacturing besides our production department at Emerson. Here are a few examples:

Manufacturing engineering—It did most of the leg work needed to establish the system. We began by working with our management and with United Shoe Machine Corporation. After many visits back and forth, we agreed on details of what the proposed equipment should do. Finally, a pilot line was built and installed in our plant.

After "debugging"—and after about 300,000 successful production insertions—we made cost estimates of the various operations the heads performed. From these estimates we made three reports, as follows:

. . . *A recommendation* on how many of each type of head to build. We had to set amortization rates—gaging them from current usage of the different types of component. In other words, we had to find the break-even point that would show how far to go with mechanization.

. . . *A programing plan* for arranging insertion heads—to minimize the changeover of components supplied to them.

. . . *A schedule* to program jobs to the machine for most efficient production results—without creating too many finished boards.

Next step was to assign a manufacturing engineer to coordinate the introduction of the system, including specification of machines. He worked with the key people concerned with the project (including several equipment builders), kept the above-mentioned three reports up to date, advised us of progress.

Product design—It had to compromise. Design engineers worked with purchasing and with parts vendors, as well as with machine builders. They compromised until they reached practical limitations on specifications. Standardization now required goes far beyond what was needed for hand assembly. For example:

. . . *Size of printed wiring boards* had to be limited. A practicable minimum dimension of 5¼x10 inches was established to keep the basic equipment from becoming too large.

. . . *Hole spacings,* hole sizes, tolerances had to be standardized.

. . . *Component parts* had to be specified critically, because hand wiring can tolerate dimensional differences that machines cannot handle. Where possible, we kept our standards within the limits of vendors' present processes. Vendor reception varied. In general, the more adaptable a component was to mechanized assembly methods, the more eager its vendor was to cooperate.

. . . *Packing of components* is still being standardized to eliminate handling and to make it possible to feed components directly to the insertion heads.

Tool design—This activity increased with automation. Design of new equipment and modification of equipment we had are now continuing activities in our plant.

Methods and timestudy—Our study of many repetitive hand operations has naturally been reduced. But we are finding a larger number of less-repetitive jobs to measure. We have expanded into more use of work sampling and memo-motion techniques to supplement our predetermined-time-standard method of work analysis. This creates a need for more carefully trained industrial engineers on the staff.

Plant layout—Our activity here has increased under the pressures of automation. We are changing from product-controlled layouts to process-controlled layouts because the automated assembly machine can be used for many of our high-volume products. The relative labor content of each of our subassemblies is changing. The above factors have caused a major reshuffling of facilities in our large plant.

Plant engineering and maintenance—This has become more important to the production operation. More equipment for plant engineering shops was needed to support our heavier tooling program. We trained more mechanics to handle this equipment. And as assembly equipment grew, we transferred some of our key mechanics to production.

Today, a shutdown of the high-speed production line would be intolerable. So we have installed a preventive maintenance program. Most of the usual maintenance has been eliminated in design of the equipment. For one thing, it has been kept simple and easy to adjust. Most parts and components are standard and readily available.

Assembly heads are almost identical, except for parts that are directly related to component inserters. Wires to electrical terminals are screw-connected for easy servicing, and held firm with Glyptal—so there's no chance of loosening.

Personnel—It has helped select qualified people within the company to set up and operate the automated equipment. We've needed several people to set up and change over the equipment—and to make machine adjustments. Special training was required to equip people for work on automated equipment. And our foreman had to be a top-notch mechanic.

Material control—This department changed its methods of scheduling work and delivering materials. The machines can complete several weeks of manual work in a day. To produce wired chassis boards at the rates at which final assembly lines use them would require too many changeovers and too many nonproductive machine hours. So we compromise—produce each type on a half to full day's run. This way, we've increased raw material storage requirements and our work-in-process inventory.

Scheduling now requires tighter, longer-range planning. Because of the large inventory to be produced in a short period of time, any missing parts or any deviation from schedule represents a large loss. And special tooling for new models requires more lead time before actual production can begin.

Quality control—It's developed charts to show when equipment operation deviates from acceptable tolerances. And we're developing automatic equipment for inspection.

Accounting—It now must find different methods for figuring burden. Introduction of a high-overhead process common to several products will require minor changes in our accounting. This problem is now under study.

SAWTOOTH ROOF design provides up to 360 foot-candles of daylight throughout building. And saved $20,000 on initial investment of fluorescent lighting fixtures.

Lighting the Sunlight Way

Need lots of no-glare light? This plant in Sunny California gets it with a sawtooth roof that saves money.

GLARE-FREE DAYLIGHT lighting up to 360 foot-candles. That's what a sawtooth roof (photo above) provides in the engineering office building of Hewlett-Packard Company, makers of electronic equipment, Palo Alto, Calif.

And that's not all. Here are some of the added benefits of the sawtooth roof construction:

. . . *Saving of $20,000* on initial investment in lighting fixtures. With a conventional ceiling, Hewlett-Packard would have had to install half as many again of its present lighting fixtures just to get 90-foot-candle illumination.

. . . *Sure pay-back of the extra cost* of building a sawtooth roof. Extra cost was about $100,000 out of a total of $500,000 for the whole building. Low investment in fixtures plus low lighting costs will make it possible to amortize the extra construction costs over a period of seven years.

. . . *Reduction of 40% in noise level* in the "bullpen" type offices. The fiber glass tile that catches and reflects daylight in the sawtooth also soaks up office clatter.

Hewlett-Packard chose the sawtooth design for its 21,600 sq.-ft. building after a careful search for the best way to put quality light on work places. A quarter-size model of one bay was built to help test out the factors involved—orientation of building, design of roof, and choice of materials and finishes. Aim was a minimum of 100 foot-candles, free of glare. Average daylight is well above that—up to 360 at midday in bright weather.

Orientation of the building and its clerestories is 5 degrees west of north. At no time of the day or year does direct sunlight enter the offices. That means no glare. Clerestory bands 10 feet deep are spaced at 20-ft. intervals, with the lower edge 14 feet from the floor. Slim Line fluorescent lights in All-Brite fixtures are hung 13 feet from the floor on 10-ft. centers.

The roof is covered with asphalt shingle, coated with aluminum paint for high reflectivity of heat and light. The ceiling is faced with fiber glass tiles—for high reflectivity and soundproofing.

At night (offices are seldom used then) the lighting installation provides 60 to 65 foot-candles.

Fixtures can be controlled from five stations in the building. Eight switches in each of six 60x60-ft. bays make it possible to turn lights on in a variety of patterns.

Future plans include a system of photoelectric cells that will turn on artificial lighting when illumination falls below 100 foot-candles.

EXTERIOR VIEW proves utility in design needn't detract from appearance. No direct sunlight enters offices as orientation of building is 5 degrees west of north.

But all the while we kept the group . . . on personal reading progress charts . . . ticularly when you try to read fast.

Speed Reading for Your Supervisors?

Why not? You don't have to call in the pro's. Any training director can plan and conduct a "home-made" course. As, for example, at Arma Corporation, where they skipped the frills, emphasized need to practise — and doubled reading skills.

LINE SUPERVISORS in Arma's engineering department have to do an awful lot of reading to keep up with developments in their field. So it's no wonder that they asked us to set up a reading improvement training program. Not only did we get the results expected from any worthwhile program — speed doubled, comprehension increased—but we did it for only minor out-of-pocket expenses. Did it quickly, too.

Box score — Average reading speed before program began—310 words per minute. Comprehension —a little better than average for 13th graders. Both scores would already be considered good for similar groups. When the program was over, reading speed checked by the same test averaged 600 words per minute. Comprehension had gone up about 15%. All the other factors the test measures had gone up, too. Informal tests showed also that these engineering supervisors could now read a newspaper at an average of 631 wpm., a news magazine at 627 wpm., and a technical journal at 768 wpm. Cost—less than $100 total out-of-pocket expense for exhibits, mimeographing, and miscellaneous supplies.

What made our program click— We put all the essentials of a sound program into our reading course, but here are the five elements that really got it winging:

. . . *No buckshot.* Our test showed that our supervisors had good vocabularies, had scored high on sentence meanings, index and chart usage. This meant we needn't waste time on fringe subjects. We could concentrate our fire on improving speed and comprehension.

. . . *Showmanship.* Principles of good reading are easy to understand —once you get the idea of how the eyes and mind work. We put this point across with a papier mache dummy we made in the shop. With it we showed how the eye moves in a series of small jerks as it moves across the page. Supervisors who saw this demonstration didn't forget it in a hurry.

. . . *Streamlining.* The biggest gripe against many a training program is that it takes men away from their jobs. We wanted to give our program on company time. But we knew we had to keep our time budget to a minimum if we were to get high attendance from these busy men. So we decided to cram the entire course into 10 hours. In addition, we put the course together so that if a supervisor missed one session, he could make it up easily at home. This plan paid off. Average attendance (which was voluntary) was 8 out of the 10 sessions. This is unusually high since our supervisors are continually called out of the plant.

. . . *Lots of practice.* You can't learn to read fast by listening to a lot of lectures. That was our reasoning when we decided to devote a good part of each hour to reading against a stop watch. We started each session with a 3- to 5-min. speed test. Then worked in from three to five more practice readings during the rest of the hour. And we concluded each meeting with at least one more speed test.

. . . *Self-analysis.* Except for the first benchmark test and the last evaluation test, we let our supervisors score themselves. Each man plotted his daily test scores on a progress chart so he could follow his own development. It also provided us with a running record to show us which individuals needed coaching.

Our approach — We had two choices. Either we could hire an outside expert to do the job for us, or we could do it ourselves. We chose the latter because it meant we could move in a hurry (we had the program under way in less than two weeks.) We could control time and content. And it would cost less. Sure, it put the heat on us to bone up on the technical details. But this wasn't too hard, for there are lots of good books on the subject. For our purpose, we used Norman Lewis's "How to Read Better and Faster," Crowell Publishers.

Once we had decided to do it ourselves, we were faced with another choice. One method of reading training is to put emphasis on mechanical aids, films, and reading pacers, and to work with the eye movements themselves. The alternate method, the one we used, is to stress understanding of what slows down a person's reading rate—and to provide plenty of practice in learning to overcome these barriers. Some experts say the former way is better, but our method certainly got the results we wanted.

Our program—Here's what we did. We split our line engineering supervisors into two groups of 20 each. They met in our conference room, on company time, for an hour a week over a 10-week period.

The first lesson began with a standard reading test (Science Research Associates, 57 W. Grand Ave., Chicago 10). This gave us a reference point so we could see where we were going. Also so we could find out, when the program was over, how well we did. Our reasoning was that, if we concentrated on improving speed and comprehension, all the other fringe qualities would improve, too. And that's just what happened.

For the next couple of lessons we discussed the principles of good reading. Here's where we brought in the dummy to demonstrate eye movements. We even proved it to ourselves by taking turns watching one another's eyes while we read.

By BEN B. MASON
Assistant to Mgr. of Employee Relations
Arma Div., American Bosch Arma Corp.
Garden City, N. Y.

But all the while we kept the group reading sample items for speed.

Beginning with the fourth lesson we began to break down the reading problem according to the type of material our supervisors needed to learn to read faster. For instance, we spent one period reading excerpts from the daily newspaper; another reading a general interest magazine; others on technical journals, business magazines, and reference books.

At each session we'd conduct three to five speed tests and have the participants record their scores on personal reading progress charts. From a set of questions I'd prepared, I'd spot-check for comprehension.

About the fifth or sixth period most of the charts showed a plateau in the improvement rate. Here's where we had to bear down to get the group to recognize how much their speed depended upon practice, concentration, and desire to improve.

We spent the ninth session reviewing principles and checking our reading rates on the various media. At the last meeting we gave the same standard test we had begun with.

Tips from Arma's reading course

How you read—Your eyes don't roll smoothly from one side of the printed page to another as you read. Instead they take a photograph of a group of words, then jerk ahead to the next group of words and take another photograph. The number c words your eye can photograph at once is called the *recognition spar* The time you spend on photographing the span is called *fixation*. The return of the eye from the end of the line to the start of the next is called *sweep*. When your eye is *sweeping*, all it sees is a blur. And since this effort is non-productive so far as reading is concerned, it should be done as rapidly as possible.

Break down these barriers:

. . . *Eye defects*. Starting point for your reading improvement is a check of your eyes. You may need glasses. Unless defects are corrected, you may never increase your speed.

. . . *Narrow span*. By a conscious effort, you can extend your "eye photograph" so that you need make only three or four fixes per line.

. . . *Long fixation*. Holding the eyes in position too long for each photograph slows you down. You've got to keep forcing your eyes ahead.

. . . *Lack of concentration*. Don't daydream. Reading means work. Paying greater attention to what you're reading will speed you up.

. . . *Regressions*. Rereading phrases or sentences is one of the worst things you can do. In most cases, what you've missed isn't important. Ability to keep going ahead will depend largely on self-confidence.

. . . *Inward speech*. Saying the words to yourself—using your lips or any part of the vocal apparatus—can put brakes to your speed, particularly when you try to read fast.

. . . *Poor vocabulary*. A college education doesn't necessarily mean a good vocabulary. Try building yours by looking up in the dictionary words you're not sure of.

. . . *Weak thought organization*. Mental processes may be your block. As in decision-making, you've got to develop your ability to sort out the important from the trivial.

. . . *Lack of practice*. Over the years you and your eyes have developed a lot of bad reading habits. And these habits can be hard to break. But lots of practice reading the right way will overcome them. And experience shows that the new habits will stick.

Find the main idea—Once you've mastered the mechanics of faster reading, the trick is to look for the main idea. Here's where you're most likely to find it:

. . . *In a business letter*. Start with head, then body, then signature.

. . . *In a newspaper article*. Read headlines and subheads, then first paragraph. Read on only if you want details.

. . . *In a technical journal* or business magazine. Read title, blurb and first paragraph. Skim the text for major theme, check subheads. Read last paragraph.

. . . *In a reference book or text*. Start with table of contents, introduction, and any preliminary notes. Read first and last chapters—reading first and last paragraphs of each and skimming rest of text. Treat other chapters the same way.

How Reading Training Can Save You Money

HERE'S HOW to figure out how much. Plant executives want to know, "Will reading training really save us dollars?" "Yes," says Robert E. Chandler. Working at the Occupational Research Center of Purdue University, he has come to two pretty good conclusions:

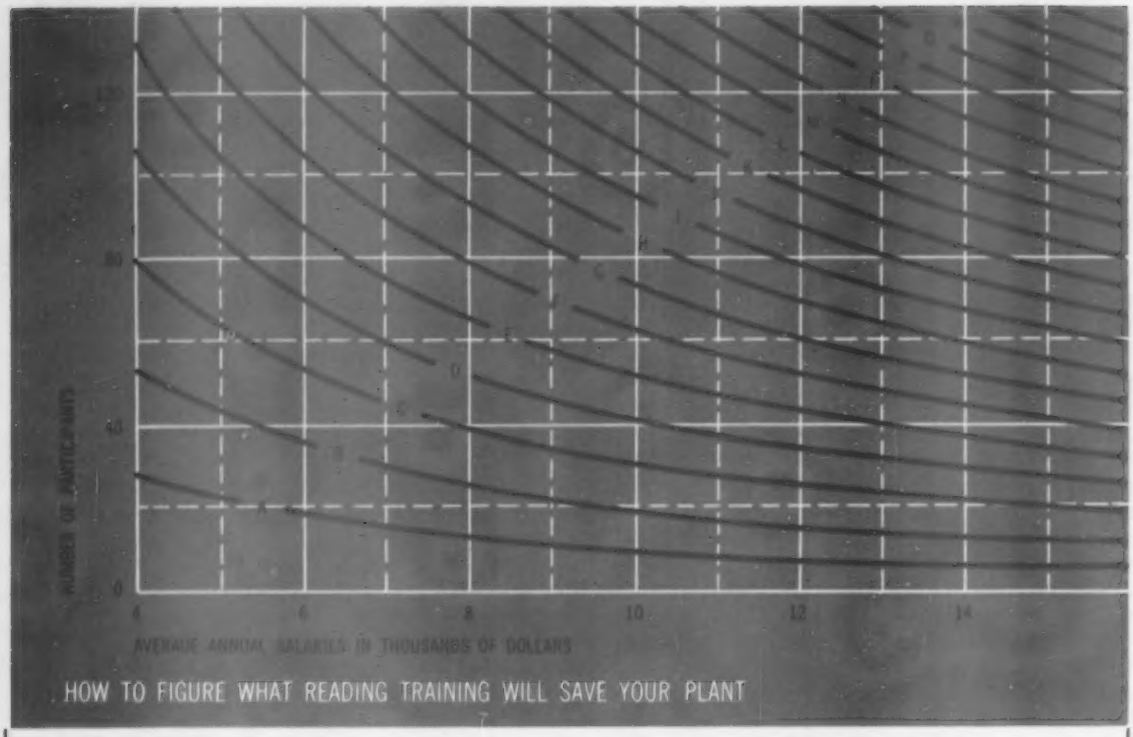
1. Reading training that is centered around a competent instructor and the use of certain mechanical aids (Purdue uses reading films and a reading pacer) can materially improve speed and comprehension for almost any type of reader.

2. This improvement is relatively permanent as proved by follow-up studies conducted several months after training.

Effective reading training rewards the individual by broadening his reading scope while at the same time making his reading task easier and more satisfactory. Pays off for the company by increasing the quantity and quality of communication reception and in improved utilization of the manager's working time.

Here's how to calculate the worth of such training to your company:

. . . *1. Locate the number of participants* who are expected to be in the training program on the vertical axis of the graph in the chart (sorry, you'll have to turn the page). Then find the average annual salary of these people on the horizontal axis. In this manner, a point will be determined on or near one of the


NUMBER OF PARTICIPANTS
AVERAGE ANNUAL SALARIES IN THOUSANDS OF DOLLARS
HOW TO FIGURE WHAT READING TRAINING WILL SAVE YOUR PLANT

LETTERS FROM ABOVE	AVERAGE AMOUNT OF WORKING TIME PRESENTLY SPENT EACH DAY IN READING				
	½ HOUR	1 HOUR	1½ HOURS	2 HOURS	2½ HOURS
A	$ 2,500	$ 5,000	$ 7,500	$ 10,000	$ 12,500
B	5,000	10,000	15,000	20,000	25,000
C	7,500	15,000	22,500	30,000	37,500
D	10,000	20,000	30,000	40,000	50,000
E	12,500	25,000	37,500	50,000	62,500
F	15,000	30,000	45,000	60,000	75,000
G	17,500	35,000	52,500	70,000	87,500
H	20,000	40,000	60,000	80,000	100,000
I	22,500	45,000	67,500	90,000	112,500
J	$ 25,000	$ 50,000	$ 75,000	$ 100,000	$ 125,000
K	27,500	55,000	82,500	110,000	137,500
L	30,000	60,000	90,000	120,000	150,000
M	32,500	65,000	97,500	130,000	162,500
N	35,000	70,000	105,000	140,000	175,000
O	37,500	75,000	112,500	150,000	187,500
P	40,000	80,000	120,000	160,000	200,000
Q	42,500	85,000	127,500	170,000	212,500
R	45,000	90,000	135,000	180,000	225,000

STEP 1. On chart, select number you plan to train. Read across to point where salary line intersects. Pick off nearest code letter.

STEP 2. Estimate average number of working hours trainees spend each day reading business materials. In table, read down column that comes closest to this figure. Find annual company savings at code letter level.

curved lines. Note the letter identifying the line closest to this point.

. . . 2. *Now look at the table* and select the row of figures having this letter in the alphabetical listing at the left-hand margin.

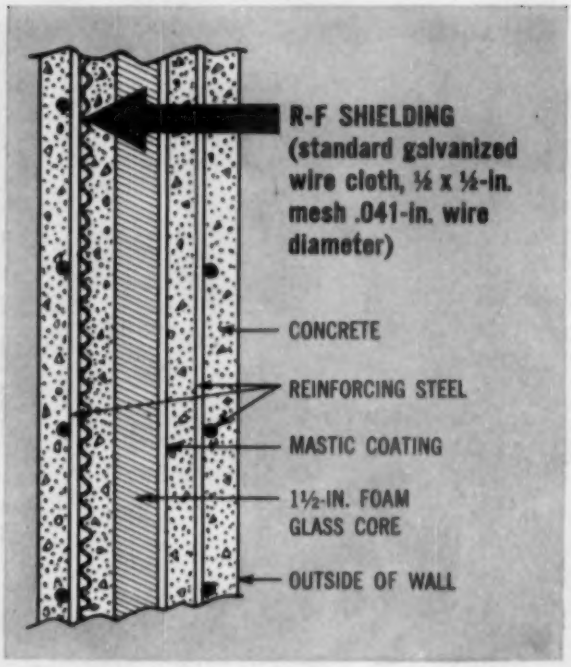
. . . 3. *Find the annual company savings* within this row and under the column heading that most nearly approximates average amount of time spent per day in reading by personnel who are expected to receive training.

To illustrate the procedure, suppose that 40 people will participate in the program and assume their average annual salary is $8000. These hypothetical values determine a point that falls on line *C* in the chart. If these people use an average of 1½ hours each day to read correspondence, reports, professional literature, etc., the company would annually save $22,500—the value given in the table from row *C* and the column headed 1½ hours.

These curves are based upon conservative observations that the reading rate of most adults participating in a reading program is *initially* 250 words per minute, and subsequent to training *will remain* about 400 words per minute.

Monetary values listed in the table are nothing more than cost estimates of the *working time* your executives may save through proper reading training. It is no guarantee, of course, that this salvaged time will be reflected in proportionate savings in your operation. But it *is* reasonable to suppose that, by increasing the length of the work day, an executive's productivity will increase just as it does for hourly workers.

GALVANIZED WIRE MESH, cast into concrete tilt-up walls, forms effective shield against radio-frequency radiation.


R-F SHIELDING (standard galvanized wire cloth, ½ x ½-in. mesh .041-in. wire diameter)
CONCRETE
REINFORCING STEEL
MASTIC COATING
1½-IN. FOAM GLASS CORE
OUTSIDE OF WALL

PLACEMENT OF MESH next to steel reinforcing is shown in above cross-section view of 5½-in. thick wall.

New Way to Beat R-F Radiation

Collins wanted to keep the r-f radiation it generated inside its new engineering building. And keep out radiation from outside sources. It used a smart new technique — built shielding into walls — and found it inexpensive and effective.

THE INTENSITY of radio-frequency radiation emanating from Collins Radio Company's new engineering building in Cedar Rapids was well below the level that would invite a visit from the FCC. But company engineers wanted to make sure it wouldn't foul up local television reception—a sure invitation to bad community relations. Also they didn't want interference from a nearby television transmitter (800 yards away) to affect the critical tests they make on their quality equipment.

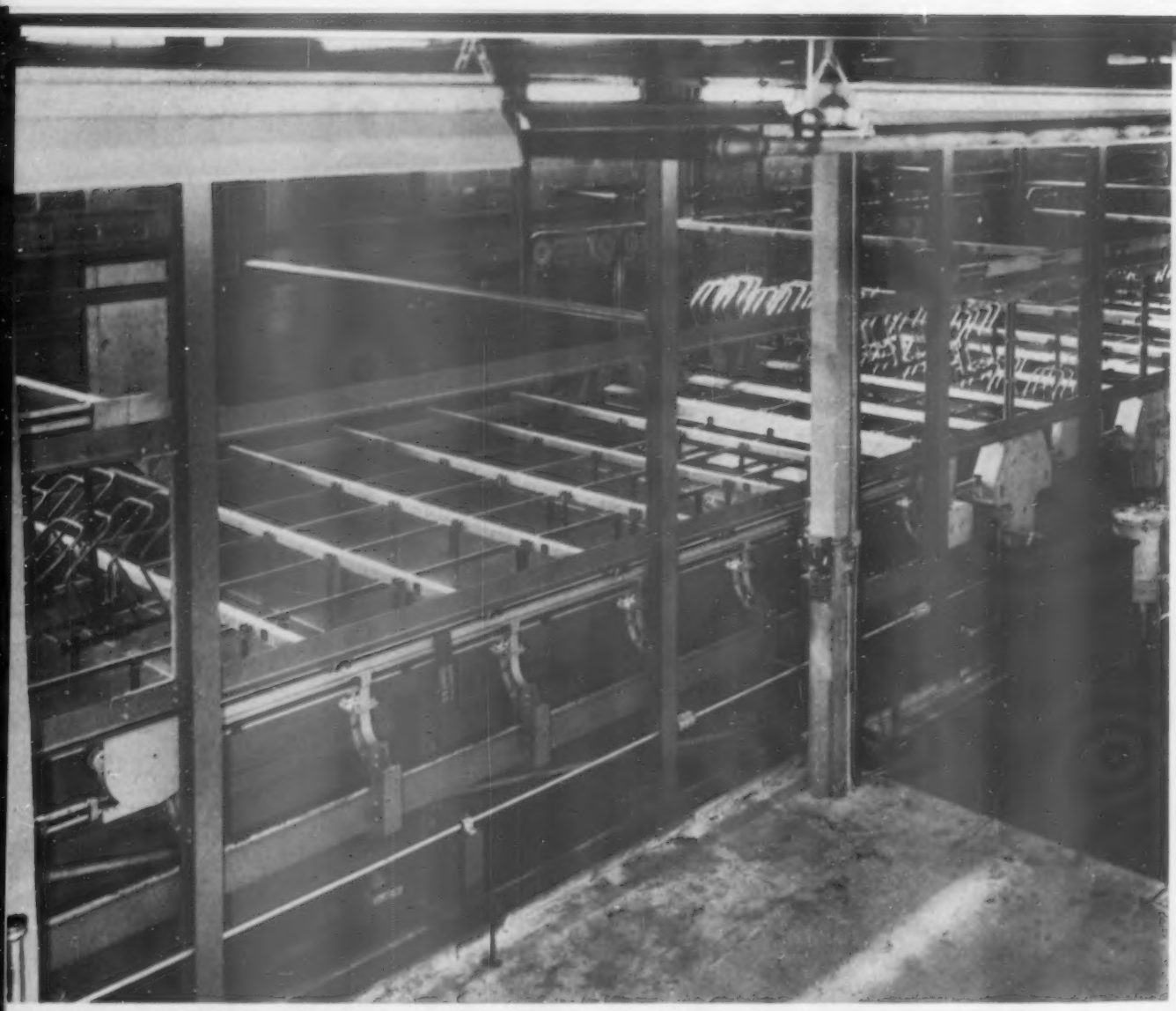
Shielding was built in — Collins engineers came up with a smart new idea to get the shielding they wanted. They sandwiched standard ½x½-in. galvanized wire mesh in the precast concrete tilt-up walls. Photo and diagram above show how job was done. Galvanized screen was used because it costs less than copper or bronze, provides better bonding between individual wires. Cost? Shielding increased total wall cost by only 6¢ per square foot.

Was it worth it?—Collins thinks so. Tests show the shielding has reduced outside interference by 20 to 30 decibels. That's not what radio engineers would call iron-clad shielding. But the installation is good enough for Collins' purposes — a good compromise between top-notch attenuation and cost.

Complete solution — The sandwich-wall shielding isn't the complete answer. But clever building ideas buttoned up the rest of the problem at almost no extra cost. The roof is steel decking—a good shield against vertical radiation. Exterior doors are hollow, with steel frames. And the frames contact the mesh in the walls to form a continuous shield. Expanded metal lath plaster walls separate the main testing area from the lobby, and the lath is tied to the exterior-wall mesh. Windows are no problem—there are none except in the lobby. Electrical, water, and other utility lines are underground, and the unit substation is totally enclosed—no radiation sources there.

Some spot enclosures were used where big signal reductions (over 100 decibels) were required. They're simple—wooden frames enclosed on all six sides with a layer of copper or bronze screening.

(For more information see FACTORY, July 1954, pages 126 and 128; "TV Interference — FCC Cracks Down" and "How Micro Licked TV Interference.")



GIANT AUTOMATIC PLATING MACHINE at Albert Plating Works is 140 feet long, 18 feet wide, 18 feet high. Key feature is ability to plate the hundreds of different parts that run through a job shop. And it's loaded with labor-saving ideas.

Ready for Any Plating Job...

...with this newest automatic monster in a Brooklyn shop. It's flexible enough to take on all comers. And takes only four men to run it.

FOUR MEN are currently doing the work of 50 at Albert's Plating Works, Brooklyn, N. Y. Two load, two unload the big new automatic plating machine above.

Built by U.S. Galvanizing and Plating Corporation, Brooklyn, this machine is probably the most flexible ever installed in any plating job shop. It can accommodate all kinds of products. Processing time in individual tanks can be varied to suit product requirements. Both the 140-ft.-long machine and the 16,000-sq.-ft. building housing it were designed for maximum efficiency.

Total cost of $500,000 included ventilation and heating equipment, plumbing, and generators to supply a total of 30,000 amperes.

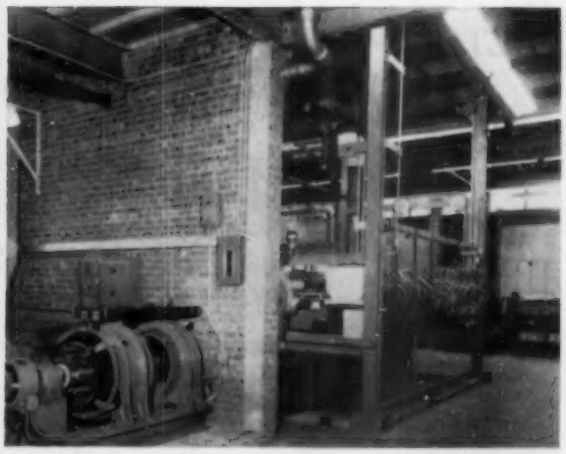
All maintenance is done from outside the machine. Other features:

... *Automatic lubrication* of chain drive from only two sources.

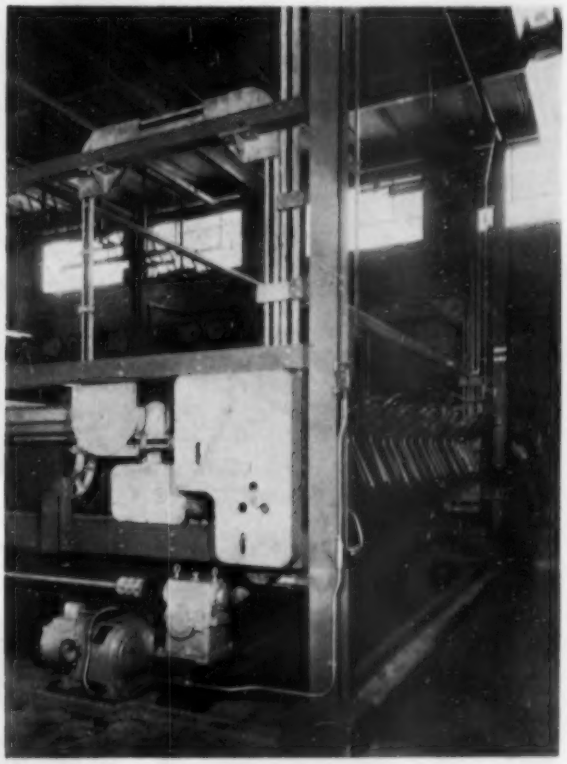
... *Safety-shutoff* pull wires that run the length of the machine.

... *Drip guards* for returning solutions to tanks.

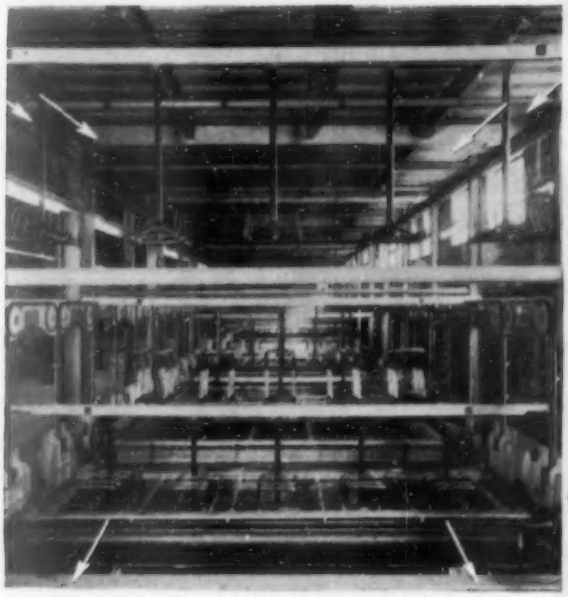
... *Recirculating and filtration* system for nickel-sulfate bath.



UNPLATED PARTS are about to begin their 60-min. trip up and down through 20 separate operations. Supporting hangers are adjustable to hold a wide variety of parts—like these for tubular furniture. Hangers engage in wedges on crossbars—for rigid electrical and mechanical connection. Generators are located close to plating tanks to reduce electrical line losses.



PLATED PARTS emerge with bright chrome-nickel finish at unloading end of machine. Normally two men do the unloading here; two others load parts at the other end. Main drive and auxiliary drives are all operated by the 5-hp. motor in the foreground. Precision alignment of tanks and chain tracks to extremely close tolerance makes this possible.



◀ **KEY TO OPERATION** is double chain drive. Moves parts hangers up and down, from tank to tank. Five parallel processing lines operate simultaneously. Main chain returns empty hangers overhead to loading station, can also carry finished parts back. Arrows indicate direction of chain drive.

FACTORY | COST-CUTTERS

By WALTER F. WAGNER JR., Associate Editor, FACTORY

Bridge Licks Two Problems

To move merchandise from plant to warehouse at Emerson Electric Manufacturing Company, St. Louis, trucks had to cross a railroad track. Elevation made a ramp necessary. Emerson got around this double trouble by putting in a swinging magnesium bridge. Bridge is hinged at one point and held up in use by a lip at each end. End opposite the pivot is on two swivel wheels that are lowered to ground when bridge is moved, raised when it's in place. They travel on a concrete runway. Automatic red lights give truckers warning if bridge is open.

Tumble on That Paint...

. . . and put an end to the boredom—and high cost—of setting up small parts. Martin Aircraft (Baltimore) has had so much luck with this spray painting method that it's even developing a production model of its tumbler rig. It's simple, and does the job 10 times faster, too.

Painter simply puts the detail parts into a 10-gal. can with baffles, and with a small hole at one end, clamps a detachable screen over opening at other end to keep the parts in. Then starts the rig rotating at 100 rpm. At 6-sec. intervals, paint and air are alternately sprayed in through the small hole. Interval allows paint to dry sufficiently to prevent surface damage.

Total time for the entire operation: 2 minutes.

Palletizing for Easy Moves

A pair of pneumatic cylinders and a couple of I-beams solved a two-fold handling problem at Ebco Manufacturing Company, Columbus: Pallets had (1) to be steadied as they were loaded, and (2) gravity-flowed to the warehouse.

Answer: See photo. Note I-beams placed on either side of a conveyor section on the floor. Handler sets pallet on I-beams to provide a firm base while moving four 165-lb. cartons from conveyor.

After loading, he actuates the air cylinders by stepping on the pedal shown in the foreground. Hinged conveyor section rises, lifts the pallet. Freed, it automatically rolls down the inclined conveyor section.

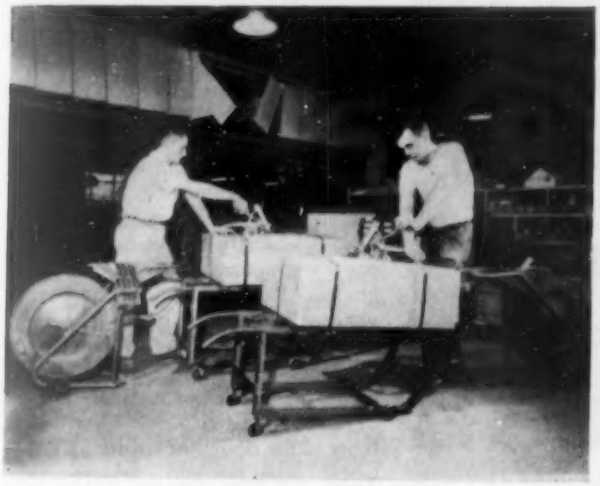
Slick Work Saves Time

Problem at Caloric Stove Corporation, Topton, Pa., was how to handle its heavy packing cases more economically.

Now, with a fork-lift truck (it's a Towmotor) and a little beeswax, the truck operator can do the job without assistance. The forks are specially tapered, and waxed so they can slide right under the object that needs moving. Periodically the operator applies more wax to keep things slippery.

So there's no longer any need for pallets. With his job-planned forks, the driver can haul the heavy cases to and from storage with a minimum of effort and jarring. He just slides the forks under and hauls away.

Through this and other handling improvements, Caloric Stove has reduced its handling costs 66%.

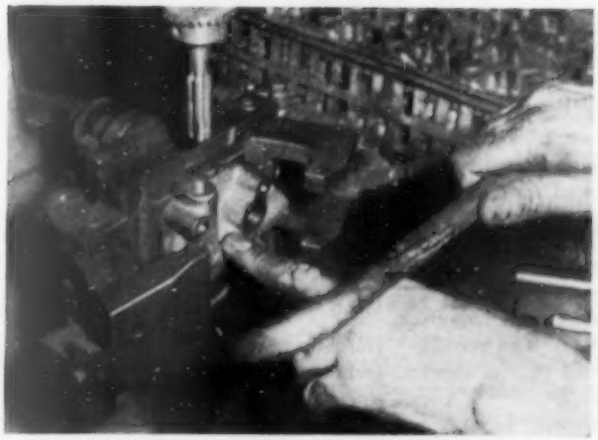


Strapping the Strainless Way

Ever try to pass steel strapping under a heavy carton —say 75 to 300 pounds? It's a job. And it was a real problem at Charles Bruning Company, Chicago. Consumed a lot of man-hours that could be better used in other ways.

But Bruning doesn't worry about it any more. What was the answer? Simple—use a grid of ¾ x2-in. channel irons. Bruning employees mounted the grid on special carts and hand trucks.

Results: no more hefting—and time saved into the bargain. In about 10 minutes—half the time it used to take—one employee, working with the new grids, can staple, load, and strap a carton, all by himself.



No Mashed Fingers Here!

At the General Motors-Holden plant, Melbourne, Australia, there's no more risk of crushed fingers in using air-clamping fixtures. (Each fixture is activated by a double-acting cylinder controlled by a double-acting valve.)

GM has now designed a ⅝-in. diameter steel tube to screw on the valve handle in place of the original ball handle. Tubing has two 90-degree bends, and is provided with a bearing hole at far end in line with the fulcrum of the valve handle.

Valve is now located on side of jig, and air is connected, so loading takes place under tubing with clamp open. As photo shows, when clamp is closed by downward movement of tube, operator's other hand is swept down and clear of danger.

FACTORY | NEWS

By W. A. STANBURY JR., Associate Editor, FACTORY

GIANT POWER of this train comes from motor in each of its 32 wheels.

Follow-the-Leader, Anybody?

New multi-unit, self-propelled trackless train hauls anything over hill, dale, desert, or swamp.

That giant motor freight train you see in the photo above has seven loaded units that follow each other around a corner like a herd of sheep —each one in the tracks of its immediate predecessor.

But that's not the only thing that's new about it. It'll haul your load through wilderness, swamp, and desert; up grades steeper than an automobile can climb. *Secret:* Every wheel of every car has its own electric motor tucked into its center. Thus this eight-car train, with four wheels per car, has a 32-wheel drive. The lead unit has an operator's cab with seats for seven people, a 3500-gal. fuel tank, and two engines with generators that provide power to the motors in the wheels of the entire train.

R. G. LeTourneau, Longview, Tex., maker of the big train, reports that three transporters already have been built. One is now moving freight to isolated areas in Alaska. Another is hauling timber and heavy equipment over a 12,000-acre proving ground. The Army Transportation Corps has ordered a fourth, and private industry has placed orders for several to be used in the United States and abroad.

More Flexibility in Paper Making

Think you've got problems trying to diversify? Then take a look at what the paper industry has faced. Machines cost a fortune. Once designed, they're limited in the type of paper they can produce. But in Ransom, Pa., the National Paper Corporation has introduced a new $2-million machine that solves this problem. It produces grades ranging from lightweight soft tissue to coarse paper toweling, or waxing-base grades. Said to be the most advanced in the industry, the new electronically controlled machine produces up to 2000 feet of 144-inch-wide paper per minute.

Key to the machine's wide flexibility is the design of its drying end, where quality and texture are determined. Ordinarily, a huge roller called a "Yankee Drier" must be used to dry soft tissue. But a series of smaller drying rolls are used on conventional paper-making machines. National's new machine uses both a 12-ft. "Yankee Drier" and a series of 60-in. after-driers. By supplying heat in varying degrees to one or the other (or both) of these driers, a wide range of product grades can be produced.

New Way to Cut Aluminum

Here's a new way to cut aluminum (and perhaps some other non-ferrous metals). It's easy. And it increases cutting speed, makes cuts

with the quality of those made by a saw, reduces the cost of cutting and edge preparation.

It's Heliarc cutting, announced by Linde Air Products Company Oct. 17 at the National Metals Show in Philadelphia. Key to the process is a very high-temperature, high-velocity, constricted arc between a tungsten electrode and the piece to be cut. Jet action of the arc stream

removes molten metal mechanically and the gas atmosphere (a mixture of argon and hydrogen) prevents oxidation of the cut face.

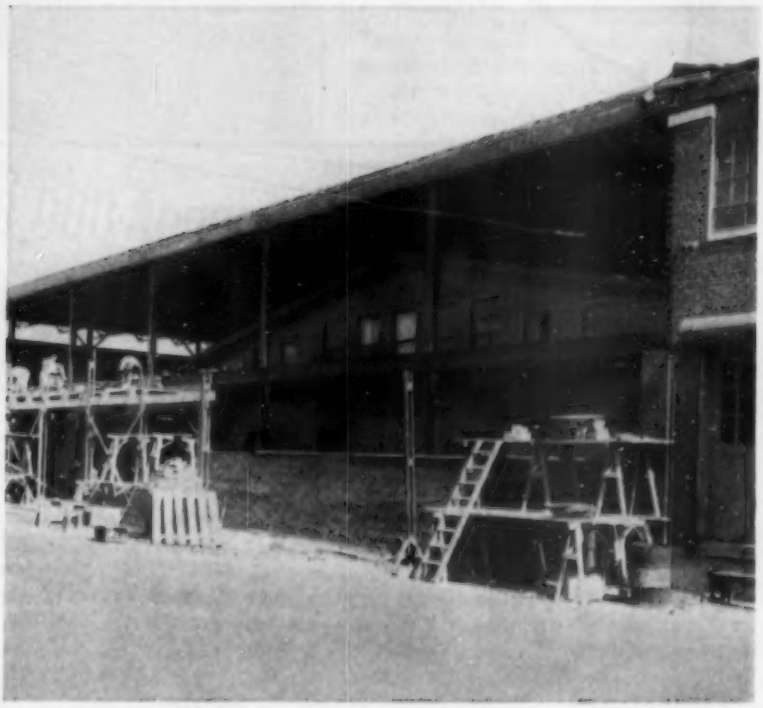
The new process can be used mechanically or manually—in any position—for cutting straight lines, bevels, circles, and shapes. In mechanical cutting, it works at speeds of 300 inches per minute in ¼-in. material, 125 inches per minute in ½-in. metal, 75 inches per minute in ¾-in. plate, and 50 inches per minute in 1-in. material. Lower speeds are available by adjustment of controls. In manual cutting, speeds vary according to the operator's skill, with an average of about 60 inches per minute on ½-in. aluminum plate. The pilot arc enables the cutter to see a scribed line with his helmet down.

Gas mixtures? Linde recommends about 65% argon and 35% hydrogen for machine work; for manual, 80% argon and 20% hydrogen.

Equipment needed? Special cutting torch, control panel, high-frequency unit for starting, and electrical contactor. Plus a high open-circuit voltage motor generator unit.

No Babe in the Woods

Not this girl. She knows where she is because the map tells her. It's one of 28 maps spotted in the stairwells at Hamilton Standard, Division of United Aircraft, Windsor Locks, Conn. Maps are black and white contact prints made from a plant drawing. On each the words "You Are Here" are outlined in red and an arrow points to spot where "lost" person stands.



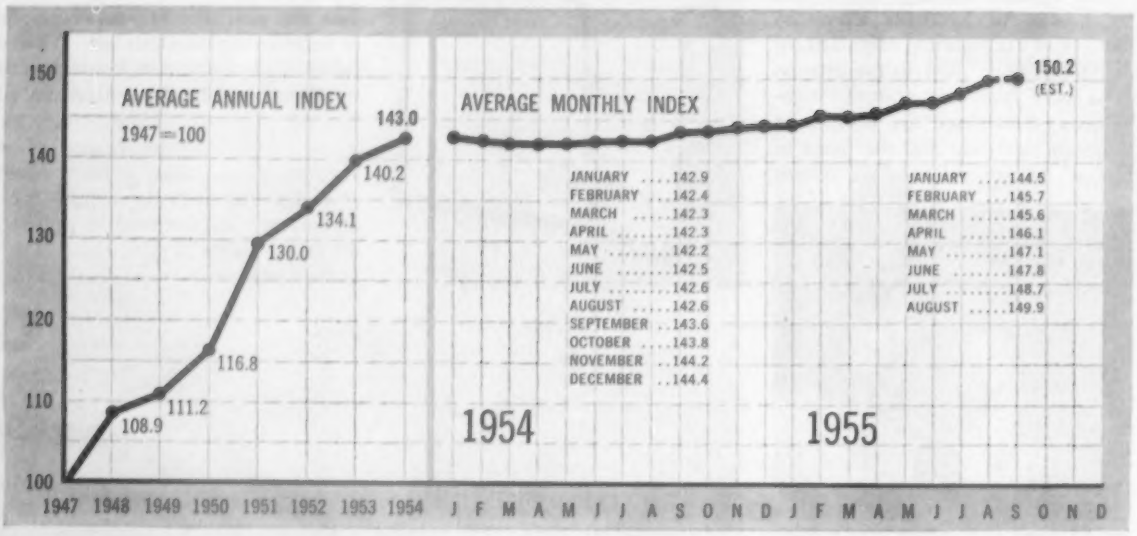
NO INTERRUPTION in old machine shop as new one grows around it.

Nobody Stops Working Here

Got to grow? Then build right around your old plant. This company did—and never stopped producing.

When Richardson Scale Company, Clifton, N. J., began building a new plant addition right on the spot where the old machine shop stood, nobody in the machine shop stopped work. Why? Because Richardson is building the new structure over and around the old one. Photo above shows how. Here's an added advantage: The roof of the old building serves as a scaffold for erection of the new building. And when the new structure is completed, the old building can be knocked down and taken out without interrupting machine-shop workers on their jobs.

FACTORY | COST INDEX



Index Charts New Highs

Wage and industrial price increases both add weight to the upward trend.

FACTORY's COST INDEX moved up sharply again in September. And indications are that the forces that pushed it up recently have not yet spent themselves.

Wage rates are still rising. With production at a high level and unemployment at a low one—now only a little over 2-million—wage rates seem likely to continue up in the months ahead.

Industrial prices also will probably keep on the uptrend, though possibly at a more subdued pace than they have charted recently. Higher industrial prices seem likely because industrial expansion and modernization plans appear to be going along as scheduled, and the over-all level of production remains high. These factors will keep the demand for materials high.

* * *

FACTORY's "Cost Index of Plant Maintenance" keeps you informed of monthly changes in cost of 1) upkeep, repair, and replacement of plant buildings and facilities; 2) upkeep and repair of operating equipment. Source of all figures: *U. S. Bureau of Labor Statistics.*

For complete information—including cost indexes for the 6-year period 1948-1953, and "10 Ways to Use the Cost Index"—send for a 16-page reprint of "FACTORY's Cost Index" (originally published in January 1954). Price 50¢. Address Editor, FACTORY, 330 W. 42nd St., New York 36.

	AVERAGE 1954	PREVIOUS MONTH (Revised)	LATEST MONTH (Sept.)
Building and Facilities Index	**136.6**	**145.3**	**146.3**
Materials	125.7	133.3	134.6
Brick	132.6	138.5	139.2
Elec. fixtures	115.1	120.5	121.2
Elec. switches, boards, fuses	141.9	146.2	151.5
Elec. wire, copper	130.3	152.4	165.2
Glass	137.3	145.2	145.2
Gutters, spouts, ducts	144.5	158.1	158.1
Gypsum products	129.2	129.2	129.2
Heating equipment	120.0	121.8	123.0
Lumber	124.2	133.8	134.5
Millwork	149.6	147.0	146.9
Paint	114.4	116.4	116.4
Pipe, cast iron	140.9	147.9	147.9
Pipe, steel	148.0	163.3	163.3
Pipe & tubing, copper	142.7	163.1	176.2
Roofing	110.5	121.7	121.8
Sanitary fixtures	144.3	151.5	151.5
Sash, metal frame trim	134.1	151.7	151.7
Solder	115.8	121.9	122.2
Steel, structural	170.3	186.5	186.5
Tanks, steel	121.0	130.7	131.2
Valves & fittings	130.6	138.2	141.3
Wire mesh	155.7	167.5	167.5
Labor	148.8	153.4	154.1
Carpenters	143.4	145.0	145.5
Electricians	152.1	154.5	155.0
Painters	151.8	160.6	161.7
Equipment Index	**144.5**	152.1	153.4
Materials	136.7	146.4	148.6
Abrasives	129.7	130.0	132.8
Alloys, non-ferrous	117.6	143.8	149.1
Bars & plate, steel	177.8	187.8	189.8
Bearings	140.7	145.5	145.5
Belting	135.1	141.6	146.1
Bolts, nuts & screws	174.9	186.4	186.4
Chain	137.6	153.8	162.2
Controls (electrical)	141.9	146.2	151.5
Gear-reduction units	143.8	151.9	151.9
Hand tools, mechanics	157.8	164.6	166.2
Lubricants	63.9	65.4	67.1
Motors	124.7	139.2	125.5
Non-ferrous metals	121.3	138.0	147.3
Precision tools	126.9	137.9	137.9
Pumps	143.2	147.0	149.5
Tools, cutting	129.0	155.9	156.6
Valves & fittings	130.6	138.2	141.3
Labor	145.9	150.2	150.3
All mfg. labor	146.0	152.0	152.8
Machine tool labor	153.2	159.7	160.4
FACTORY's COST INDEX	**143.0**	**150.0**	**151.3**

Remington Rand

BETTER BUSINESS METHODS

For Greater Profits Through Lower Costs

SAVED...More Than $48,000 Annually with Kardex Inventory Control!

The use of Remington Rand Kardex Visible Systems for materials control and inventory records produces savings that are almost unbelievable. Consider the experience of the Baldwin-Lima-Hamilton Corporation of Eddystone, Pennsylvania, one of the world's largest manufacturers of diesel locomotives. This organization now realizes savings of more than $48,000 each year in their Renewal Parts Inventory alone as a direct result of switching to Kardex. With Kardex, two clerks now replace the five formerly required; they do more work and handle customer orders more quickly. With Kardex, the availability of material is indicated immediately—*before* orders are sent to the plant for processing.

These are but two of the many advantages of Kardex that add up to more than $48,000 annually for this manufacturer. Learn more about how it's done by circling CH992. Learn more about Kardex and how this remarkable, money-saving system may be employed by you by circling KD406 for your free copy of "Kardex Inventory Control."

Simplified Payroll Accounting with Punched-Card Methods

Modern-day payroll accounting has become an increasingly complicated and costly business operation. The answer to this problem lies in punched-card accounting procedures. Remington Rand produces punched-card equipment necessary to handle all possible variations in payroll accounting with lightning speed and unfailing accuracy. You can learn more by circling SPTM4155 Rev. 2.

Increased Production with the Transcopy Duplex

Manufacturer after manufacturer is discovering how to expedite production with the Remington Rand Transcopy Duplex photocopying machine. At the El Segundo Division of the Douglas Aircraft Company, Inc., for example, Remington Rand Transcopy Duplex machines are replacing typewriters for the exacting work of duplicating Manufacturing Outlines. North American Aviation, Inc., of

Columbus, Ohio, expedites and adjusts factory production orders at but a fraction of what this work used to cost, eliminating typographical errors entirely.

To learn in greater detail how these two manufacturers are expediting production with the aid of the Remington Rand Transcopy Duplex, circle CH1017.

Remington Rand

DIVISION OF SPERRY RAND CORPORATION

Room 2170 315 Fourth Ave., New York 10

Yes, I'd like to have the literature circled.

CH992 KD406 CH1017

SPTM4155 Rev. 2

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

107

Profit-Building **IDEAS** For Business

FACTORY | MAINTENANCE TRENDS

By CARL G. WYDER, Maintenance Editor, FACTORY

OVERHEAD double-faced signs at Hamilton Standard help control . . .

Smoking in Hazardous Areas

Seeing is just as good as reading. Workers can't possibly miss Hamilton's distinctive warnings.

When a worker at Hamilton Standard Division (Windsor Locks, Conn.) sees a glowing orange sign with black lettering on it, he knows it means "no smoking," nothing else. These are standard "no smoking" colors in various United Aircraft divisions. Even if you're not close enough to read 'em, you can see 'em.

There are two types. Small signs are used at specific jobs where there is only one fire hazard. Large signs identify areas where flammable gases or materials create greater hazards. These areas — about 25 of them — change constantly with production relayouts.

On-the-job smoking has been regulated at Hamilton Standard since 1947, when a supervisors' "Smoking Committee" was organized (no state permit needed for smoking areas). It makes a complete survey of the plant every six months. Members: fire chief, plant engineer, health and safety supervisor, and administrative assistant to general manager.

When to Replace Equipment

This will be one of the new subjects coming up for discussion at the next annual Plant Maintenance & Engineering Show. Dates: January 23-26. Place: Convention Hall, Philadelphia.

Another new one is "Yardsticks to Measure Effectiveness of Maintenance" — which ought to interest cost-minded plant operating executives. And "How We Look at Preventive Maintenance" leads off the rich program in a 10 a.m. general session. You'll find other new subjects right up your maintenance-problems alley. Plus 16 round-table sessions to air your questions on administrative and shop problems as usual.

Better lay plans now for that trip. If you're smart, you'll try to sell the boss on sending the company controller, also your assistant. And if the budget allows, how about some of those foremen on the firing line? Maybe even the boss himself.

"And Don't Forget the Stink-Killer"

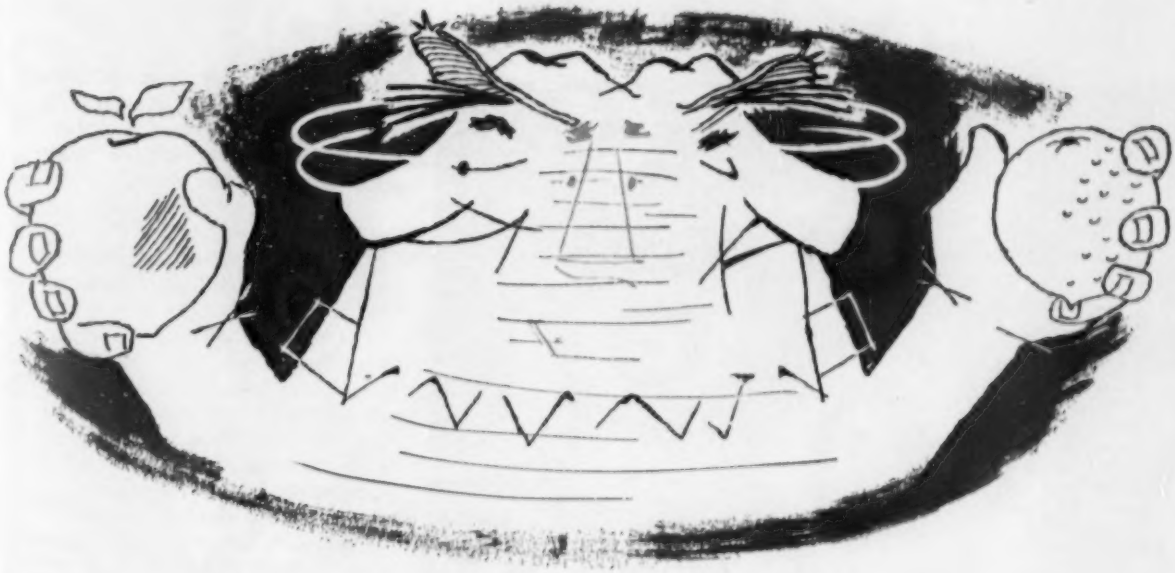
Who'd ever think to include odor-control equipment in a list of "must" tools for cleaning up flood damage?

Yet it solved a smelly situation at Wallace Barnes Company in Bristol, Conn., after hurricane Diane swamped the plant. For three days men had been working in an atmosphere foul with sewage odor. They had to clean out silt and muck up to 4 feet high in storeroom and production areas. And right early they were getting sick from the stench. Morale was poor. Efficiency took a nose-dive. And work fell far behind schedule.

Somebody thought of neutralizing the malodor with Airkem. But complete odor-control techniques require an enclosed area — and the flood had removed all windows and doors. So an Airkem engineer rigged up an electric vaporizer to feed Airkem continuously to the general area. Also he sprayed a solution on the work clothes.

Morale and efficiency jumped immediately. Men took deeper breaths, pushed shovels harder. Daily follow-up treatment, and then a spray of contact deodorant and bactericide on floors in plant and office finally chased all traces of odors and germ-breeders away.

YOU CAN'T REPLACE A PEACH WITH A LEMON!



says HY WHEELER, the sage of the socket wrench!

Of course, I don't claim *nobody* else makes good bearings—but you're *never in doubt* when you replace a Hyatt with another Hyatt!

Sure, you may save a little dough on "bargain" offbeat bearings—but take it from an oldtimer, *it don't pay in the long run!* Chances are you'll end up havin' to do the whole job over again before long, and with somebody sore at you, too! I figger it's a lot smarter to play safe and *hold out for Hyatts in the blue and yellow box.* When it comes to *quality,*

DISTRIBUTED BY DEALERS EVERYWHERE

there's no substitute for . . .

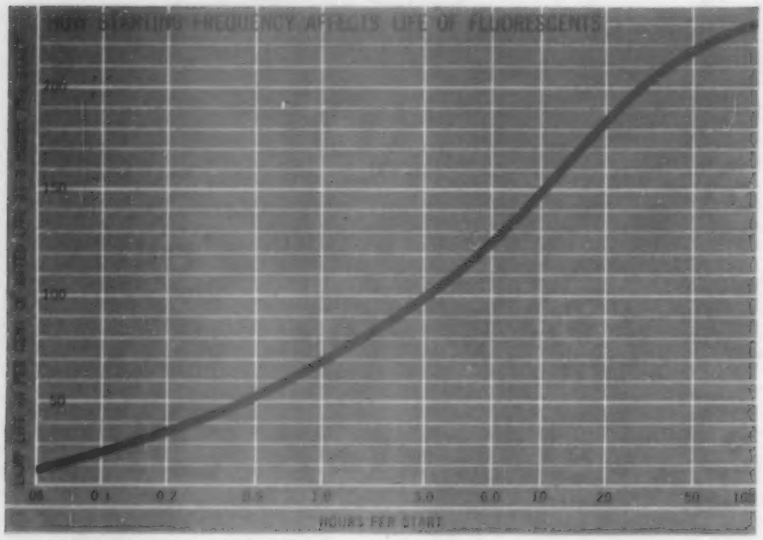
HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

A GENERAL MOTORS PRODUCT GM A UNITED MOTORS LINE

By F. W. MICHAL, Electrical Editor, FACTORY



GRAPH helps figure whether to turn fluorescents off, or leave them on.

Burn 'em — or Turn 'em Off?

BIG QUESTION, if you've got fluorescents. And a question every plant operator asks himself time and again. It also winds up pretty consistently in the suggestion box. And my guess is that a lot of answers are only guesses.

But there are ways of getting an answer. Here's an approach (the accompanying graph is part of it) that I picked up from General Electric's *Lighting Engineer*. I suggest you tuck it away—but not far away. Chances are you'll need it soon.

You know that the life of fluorescent lamps is affected by the number of times they're started. That's why lamp-life ratings are commonly based on a specified number of hours per start. So to find a solution to your problem, we have to compare the over-all costs of two ways of operating one lamp for a day.

First we must find cost per day when lamp is allowed to burn during the questionable periods. Then we have to figure cost when lamp is turned off during the questionable periods. The two cases will show a difference in lamp life. This difference in turn will affect cost of lamps and replacement labor.

Here's a formula that ties it all together (W = lamp and ballast watts; E = energy rate in $/kwhr.; R = lamp and replacement-labor cost; A, B, C, . . . etc. = periods of burning time in hours; L_a, L_b, L_c, . . . etc. = lamp life for each burning period relative to lamp life at 3 burning hours per start, extrapolated from the above graph):

$$\text{Operating cost in \$/lamp/day} = \frac{W \times E}{1000}\left(A + B + C + \dots\right) + \frac{R}{7500}\left(\frac{A}{L_a} + \frac{B}{L_b} + \frac{C}{L_c} + \dots\right)$$

Now let's work out an example that could occur in your plant. Problem is: Should lamps be turned off for 15 minutes at lunchtime, when room is empty?

Assume—40-watt preheat lamps burn continuously for 9-hour working day, and again for ½-hour at night; 1.5¢ per kilowatt-hour energy rate; 77¢ lamp cost, 50¢ replacement-labor cost; 47.75 watts for lamp plus ballast.

Get values—You want to know L_a, L_b, etc. Use graph as follows:

1. Locate hours for each burning period on the "hours per start" scale at the bottom of the graph.
2. Move your pencil straight up the graph to the curve.
3. Cross to the left along nearest horizontal line until you reach the "per cent lamp life" scale.
4. On this scale read the values to use for L_a, L_b, etc. Note that 110%, 116%, and 52% (the values you get) must be expressed as 1.10, 1.16, and 0.52 when you use them in the formula, as below. (The graph applies to G-E general-line, rapid-start, and slimline lamps.)

Compute—Substitute all values in the formula as follows:

If you leave lamps on

$$\text{Cost} = \frac{47.75 \times 0.015}{1000}\left(9 + 0.5\right) + \frac{0.77 \times 0.50}{7500}\left(\frac{9}{1.43} + \frac{0.5}{0.52}\right)$$
$$= 0.00680 + 0.00123$$
$$= \$0.00803 \text{ per lamp per day}$$

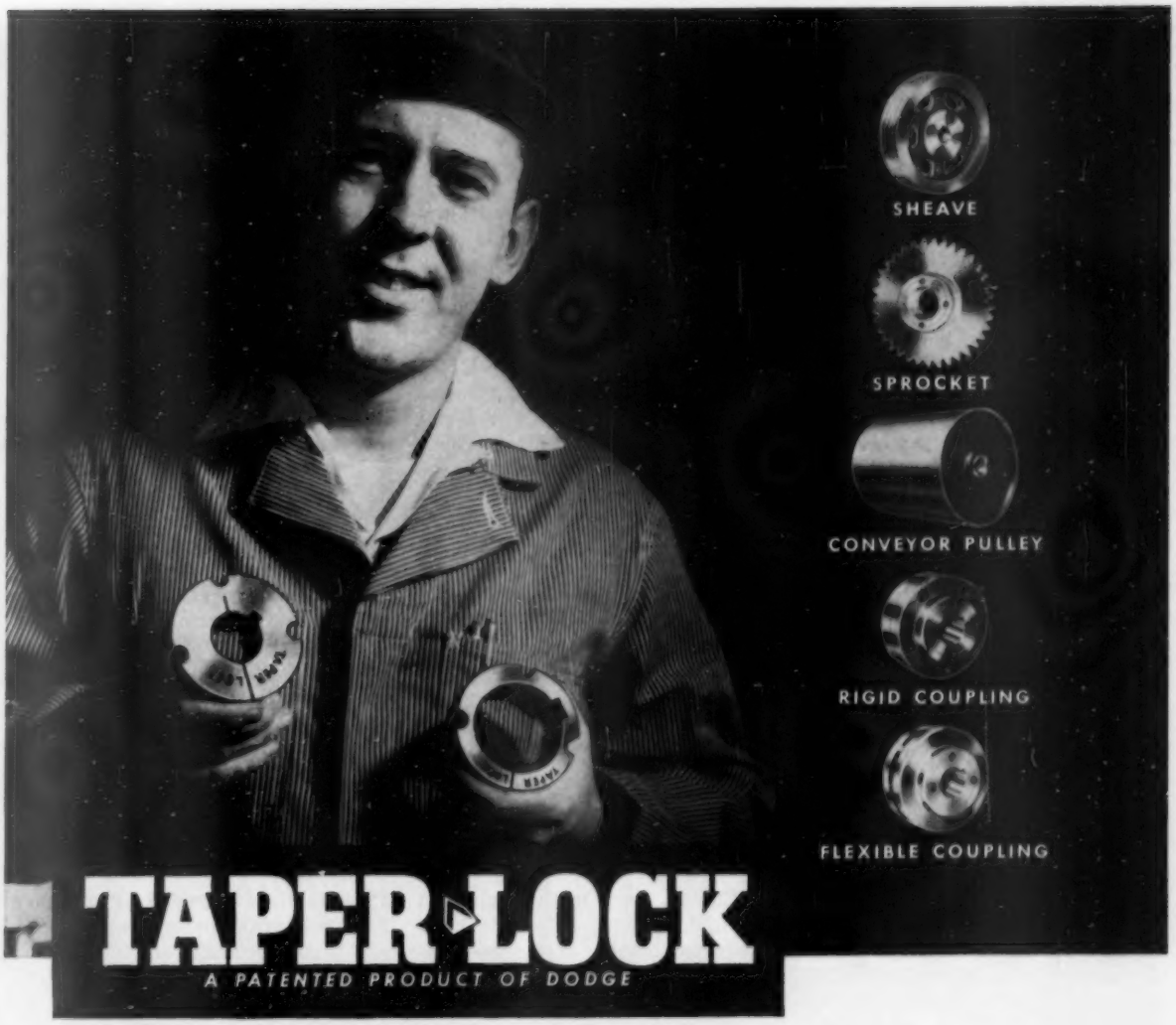
If you turn lamps off

$$\text{Cost} = \frac{47.75 \times 0.015}{1000}\left(4 + 4.75 + 0.5\right) + \frac{0.77 + 0.50}{7500}\left(\frac{4}{1.10} + \frac{4.75}{1.16} + \frac{0.5}{0.52}\right)$$
$$= 0.00662 + 0.00147$$
$$= \$0.00809 \text{ per lamp per day}$$

Find savings—To find total savings per day, multiply saving per lamp per day by total number of lamps in installation. Thus, in our example, if there were 10,000 lamps in the room, total savings per day in letting them burn through the lunch period would be 600 mills. That's about $150 in a work year.

Not a big saving, of course. That's because the 15-minute questionable period is nearly as long as the break-even period, which in this example happens to be about 20 minutes. When there is only one questionable period per day, it must be much longer than the break-even period if you expect to realize any worthwhile saving.

But the greater the number of questionable periods, the greater the possible saving you can achieve.



"Brother...you sure can save with these interchangeable bushings!"

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Mount 'em all with Taper-Lock bushings—your sheaves, sprockets, couplings, conveyor pulleys. They slip on the shaft quickly—hold with the firmness of a shrunk-on fit—come off easily without shock to bearings or machinery. Standardize, economize with Taper-Lock.

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CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

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FACTORY | CATALOG NEWS

To get these catalogs, circle item numbers on the Reader Service Card next to back cover.

MAINTENANCE

1—Floor Care. Long-range and day-to-day maintenance programs for all types of floors are described in detail in illustrated booklet, "How to Care for Your Floors." Section on treatments for most common floor failures. 24 pages. *S. C. Johnson & Son, Inc.*

2—Scaffolding. The whole truth on "Swiss-Lok," a system requiring no tools for erection. No cross-bracing. Photos point up such features as erection speed, heavy loading capacity, adaptability. Assembly and parts illustrated. 6 pages. *Swiss Fabricating, Inc.*

3—Prime Lubricator. A self-propelled, self-powered, portable lubricating unit is presented in this bulletin. Photos show applications in six different industries. Three types of control handles available; three reels. Form 5559-L. *Aro Equipment Corp.*

4—Sprayed Metal Coatings. Bulletin contains data on application to processing and food handling equipment to provide contamination protection. Discusses combinations with other materials to provide corrosion protection to tanks, etc. *Metalweld, Inc.*

BUILDINGS

5—Insulating Building Block. Bulletin tells how you can erect completely insulated and surface-finished walls in one operation. Describes block combining insulation and ceramic finish. Suggests uses. *Pittsburgh Corning Corp.*

6—Safety Grating. Anti-skid construction of steel or aluminum "Grip-Strut" is explained in this 12-page booklet. Described and illustrated are general applications, installation and assembly. Includes stair treads. Load tables; ordering hints. *Globe Co.*

7—Door Heaters. Bulletin DH-2 shows you how to put a curtain of hot air between outside cold and workers indoors whenever doors are opened in winter for unloading, shipping, etc. Discusses methods of control. Includes selection chart. *L. J. Wing Mfg. Co.*

8—Radiant-Acoustical Ceiling. Here's the story on a system that combines most effective features of radiant and forced air heating and cooling methods with acoustical treatment and easily installed lighting. Tells how it works; how to install. *Simplex Ceiling Corp.*

PRODUCTION

9—Cutters. Some of the equipment shown in Bulletin EC-9155: hand shears, automatic and semi-automatic cutting or shearing machines, bench shear, universal shear, standard power shear, production cutter. Offers blade and engineering service. 11 pages. *Hobbs Mfg. Co.*

10—Vacuum Melted Metals. Technical Bulletin VM-101 covers effects of vacuum melting on properties of various metallic materials, benefits of process to the user, fabricating and machine recommendations. Data on two alloys. *Carboloy Dept. of General Electric Co.*

11—Finishing Stampings. Bulletin 117-D contains four case histories of companies that finish stamped metal parts by airless abrasive blasting. Photos show equipment at work. Performance data. 8 pages. *Wheelabrator Corp.*

12—Drill Units. Special section of this catalog permits reader to trace, by numerical reference, operational action of automatic cam-driven unit on drilling and tapping operations. Photos, line drawings, specs cover two models. 12 pages. *Morris Machine Tool Co.*

13—Press Room Equipment. Some of the equipment covered in this 19-pager: feeds, indexers, straighteners, choppers, reels, coil cradles, foot presses, surface plates, die set pullers, guards, lever control, sheet metal separators. *Durant Tool Supply Co.*

14—Forging Hammers. Catalog 155 contains interesting history on art of hot and cold forging. Gives data on four types of hammers: cushioned helve, upright helve, upright strap, and compact type. Photos, specs, descriptions. 18 pages. *C. C. Bradley & Son.*

15—Molded Extruded Products. Facilities for custom-making rubber and plastic products are offered in this 8-page bulletin. Photos show laboratory control and molding processes; wide variety of parts. Discusses finishing techniques. *Geauga Industries, Inc.*

16—Saws and Knives. 60 pages of hacksaws, hole saws, band saws, band knives. Descriptions, illustrations, application data, and reference tables cover complete line for many jobs and materials. Cutting charts, trouble charts. Bulletin 1053. *L. S. Starrett Co.*

17—Seamless Welding Fittings. Alloy, carbon, and stainless steel fittings are offered in 60-page Bulletin FB-500. Detailed data on grades and size ranges; types of fittings and flanges available. *Babcock & Wilcox Co.*

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Permite Rust-Blok is a big money-saver because it is a positive rust inhibitive primer and a top grade Bakelite aluminum finish combined in one coating. Makes spot priming of rusted metal unnecessary. Absolutely prevents rust from growing and spreading under the paint film.

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FACTORY | EQUIPMENT NEWS

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FLOWMETER has no restrictions or moving parts to obstruct flow or cause clogging. Pressure drop is virtually zero. Made of steel, bronze, aluminum, stainless, other corrosion-resistant materials. Here it's connected to dial indicator.

Ultrasonic Flowmeter

Measures mass or volume flow of almost any fluid without being affected by accompanying variables.

THIS INSTRUMENT will handle petroleum, kerosene, chemicals, most slurries, food, milk, alcohol, distilled water, aqueous solutions, liquefied gases—even molten metal. Temperature and density do not affect flow measurement. Or variations due to pressure, viscosity, gas bubbles, solids in suspension, electrical conductivity, position of installation. Converts to mass flowmeter by adding third transducer. And you can use conventional voltage indicators for volume or mass flow signal.

Vital statistics: Capacity is 12,000 lb. per min. with fluid density range of 2.5 to 1. Temperature limit is −50 to +225 deg. F. on standard units; to 750 deg. F. on special. Pressure limit is 150 and 300 psi.; can be higher. Adapts to pipe size down to 2 in.

Fischer & Porter Co. (Circle No. 1, Reader Service Card.)

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INVINCIBLE
WELDING FLUX RECOVERY SYSTEMS

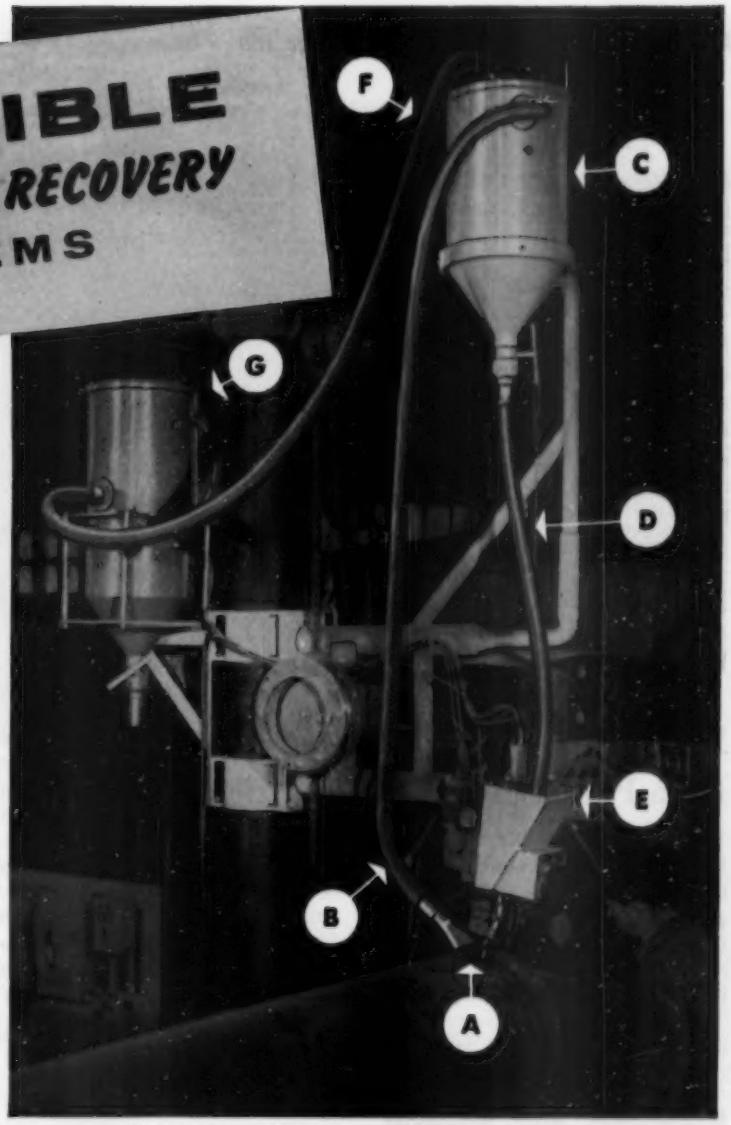

Photo courtesy of Northern Power and Industrial Piping, Ltd., Toronto

Reclaim Flux Automatically... Give Big Return on Investment

By using Invincible Systems on submerged arc welding jobs, one manufacturer salvages 100 pounds of flux daily; another reclaims $400 worth each day. Value of the material alone paid for the units within a few weeks.

Invincible units, like that in the photo, recover all unfused flux, remove powder and return slag-free, dust-free flux to the welder in a *continuous flow.*

Recovering flux is only part of the story. Invincibles also save costly manhours over manual methods, speed production and minimize expensive rejects by eliminating flux flour.

Invincibles are available in a wide variety of automatic and manual models. Compact, and highly flexible, they can be fitted to your specific operations, eliminating the need for costly tailor-made installations. Engineered to resist the abrasive nature of flux, Invincibles are ruggedly built for heavy-duty service.

Automatic operation of this Invincible makes possible complete recovery of unfused flux from circumferential butt weld operation. Here is how it works:

A. Nozzle draws flux up from work.

B. Recovery Hose.

C. Primary Separator separates usable flux from slag and fine dust.

D. Return Hose.

E. Flux returned into Hopper of welding head.

F. Hose connects Primary Separator (c) to Vacuum Producer (g).

G. Invincible Vacuum Producer provides vacuum for entire system and draws off the fines.

WRITE TODAY FOR FOLDER
giving full information on all types of Invincible Flux Recovery Systems.

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VACUUM CLEANER MFG. CO.
DOVER, OHIO
OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

It's a Wall—
It's a Parts Storer

It's convenient, flexible, neat. "Hallowell" storage wall consists of nests of drawers stacked and bolted together to form a self-supporting partition for office or shop. At the same time, wall provides easily accessible storage for small parts.

Basic building blocks are rugged steel drawer cases that hold three or four tiers of drawers. Drawers that fit inside cases come in three widths. They're interchangeable and nest for shipment throughout plant. Take apart and relocate as needed. Erect against building walls to put dead space to work; install underneath or above shop work benches for on-the-job location of spare parts and tools; insert within standard shelving and counter units.

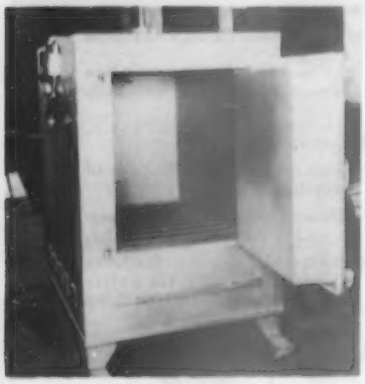
Standard Pressed Steel Co. (Circle No. 2, Reader Service Card.)

3—Radiation Detector responds to 98% of any temperature change in less than half a second, without physical contact. Ideal for fast moving bars, billets, sheets; for determining temperature distribution along moving slab, strip, sheet. *Minneapolis-Honeywell Regulator Co.*

4—Loading Attachment for cylindrical grinders automatically loads work pieces between centers and removes them when ground. Permits operator to attend a battery of machines. Adapts to variety of small parts that can be rolled by gravity on inclined rails. *Norton Co.*

5—Profile Meter Equipment permits automatic surface-roughness inspection. Directs parts into "accept" or "reject" chute according to selected range of roughness. Measures along OD or flat surface, including tapers; parts with grooves, shoulders. *Micrometrical Mfg. Co.*

6—Motors, direct-current, armored, are made with an advanced insulation utilizing Class H materials. Offered at no increase in price. Insulation withstands temperatures to 180 deg. C. Class H insulated coils may be interchanged with Class B coils. *General Electric Co.*



7—Gas-Fired Oven has adjustable temperature control from 100-1000 deg. F. Wide range makes it suitable for jobs such as burning off old insulation on electric motors, baking on new varnish after rewiring. Work space is 26x30x30 in. Removable drip pan. *Grieve-Hendry Co.*

8—Lift Trucks are equipped with fully automatic gear shifting. Permits faster, smoother handling, with greater operator comfort and safety. KGA51 line built in capacities of 3000-8000 lb. Transmission unit can be removed without disassembly. *Yale & Towne Mfg. Co.*

9—Constant-Voltage Welders allow operator to select arc voltage which remains constant during entire welding cycle. Insures uniform deposit. On field jobs, increases welding capacity derived from power source. *Harnischfeger Corp.*

Turn the page

PHYGON-XL is a low-cost and effective control for the most troublesome nuisance organisms in water—Algae.

Algae in an industrial water system can have far reaching effects on acidity, on outlets, inlets, filters and pipes in a distribution system. Use Phygon-XL to eliminate these troublesome factors. Added directly into the system at a rate of four pounds per million gallons of water, PHYGON-XL reduces over-all purification costs and the frequency of cleaning or back-washing filters.

Using PHYGON-XL to suppress blue-green algae blooms in lakes, ponds and reservoirs, also provides an opportunity for the vigorous growth of helpful aquatic plants. It can be mixed with water and applied as a spray over the area to be treated—about one half pound to one pound of Phygon-XL for blue-green algae, and five pounds for green algae per acre of water surface.

You'll find PHYGON®-XL is: effective, easy to use, and inexpensive. Write, wire or phone us if you are unable to locate an immediate source of supply.

Naugatuck Chemical

Division of United States Rubber Company
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producers of seed protectants, fungicides, miticides, insecticides, growth retardants, herbicides: Spergon, Phygon, Aramite, Synklor, MH, Alanap, Duraset.

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- Breathing apparatus
- Exsufflator valve
- Packaging Machinery

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- Coupon book printing-collating machine
- Banknote production equipment and processes
- Hard case bindery machines (5 major units)
- Electronic register controls
- Binding process

AVIATION
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- Aircraft instrumentation

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Engineering and Research Laboratory

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10—Limit Switch controls two independent circuits. Sealed construction and high electrical capacity, plus adjustability, makes it suitable for many jobs where space is limited. Rating of Model 1LS1 is 10 amp. at 120, 240, 480 volts a-c. *Micro Switch.*

11—Dust Collector, cyclone-type, is 75-95% efficient. After-filter mechanism uses six "throw-away" filters of glass insulation wool to remove fine dust not trapped in 4½ cu.-ft. capacity internal reservoir. Recirculated air filtered back into room. *Torit Mfg. Co.*

Turn the page

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Metal sheets, automatically separated, picked up and advanced one at a time to feeding—in point of machine to which it is attached at speeds up to 150 sheets per minute.

Should two sheets adhere, they are automatically transferred to a reject tray. Rubber suction mouthpieces and drop rollers prevent scratching.

Standard Feeder handles metal sheets from 14" x 18" up to 36" x 44" between 24 and 38 gauge stock. Feeders for larger size and heavier gauge metal sheets also available.

Continuous reloading avoids machine stoppage. New loads are placed in feeding position, while machine is operating, thus maintaining continuous automation cycle.

Dexter Feeder may be attached to Metal Litho Presses, Coating Machines, Sorting Machines, Shears, Slitters, Sprayers, Punch Presses, Stove Pipe Machines, Buffers and numerous other metal working machines.

Custom built sheet feeders for handling paper, cardboard, corrugated and other types of sheets are available to meet specific requirements. Inquiries invited.

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The Allis-Chalmers line extends from small manual starters for fractional horsepower motors through starters applied in controlling up to 2500-horsepower motors. Built into every control is the type and degree of protection required to meet your specific needs. Control functions, varying with application, include full or reduced voltage starting, acceleration, speed control, reversing or non-reversing, and dynamic braking.

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An Allis-Chalmers recommendation is backed by the experience gained in solving thousands of control application problems . . . by complete research and testing facilities. Get all the facts. See your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

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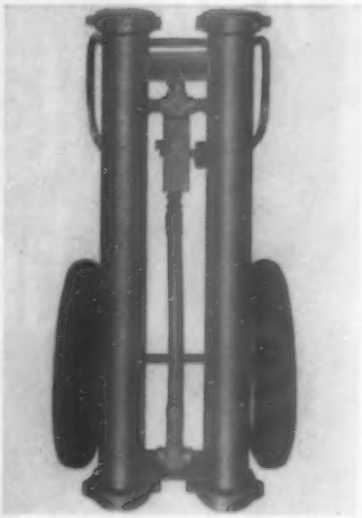
FACTORY / EQUIPMENT NEWS

Begins on page 160

For more about these products circle item numbers on Reader Service card next to back cover.

12—Pneumatic Saw-File is for iron, steel, aluminum, wood, other materials. Stroke adjusts ¼-1¼ in. for dead-end sawing and filing. Front barrel rotates 360 deg. for scroll and circle cutting. Weighs 3¾ lb.; needs only 90 lb. pressure. *R and G Engineering Co.*



13—Filter Buggy is mounted on pneumatic or rubber wheels for on-the-spot filtration of hydraulic systems and machines. No motors or pumps; uses hydraulic power furnished by unit. Filter area is 13,944 sq. in. Removes particles to 25 microns. *Schroeder Brothers.*

14—Breather and Drain is for explosion-proof combination starters and circuit breakers; other housings in Class I, Groups C and D, hazardous locations. Drains off accumulated water; ventilates housing; prevents clogging due to dust, small particles. *Crouse-Hinds Co.*

Turn the page

DEHYDRATINE NO. 22

seals out moisture... stops efflorescence on masonry walls

Silicone base water repellent protects your structures from inside and outside water damage.

Dehydratine No. 22 is no ordinary "surface" repellent. It functions on the principle of "negative capillarity" *in depth*. The highly penetrating characteristics of Dehydratine No. 22 set up a valve-like action within the masonry that permits vapor to escape *outward*, but stops the capillary absorption of solid drops of moisture from passing inward.

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Don't neglect leaky walls—avoid serious structural defects and expensive repairs.
Watch for this telltale symptom of water penetration!

A Subsidiary of Sun *Chemical Corporation*

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Automation Creates Jobs For Workers With Skills

There is new and reassuring information for those who fear that "automation" — the control of machines by machines — will mean fewer job opportunities. It comes from a special survey of 1,574 companies in metalworking industries recently completed by AMERICAN MACHINIST, a McGraw-Hill publication. More than one-fifth of the companies reported that they already have automatic loading, transfer or assembly machinery in operation. In these companies as a whole there has been a net increase in total employment since this machinery was installed.

According to the AMERICAN MACHINIST survey, of these companies with actual experience in automation

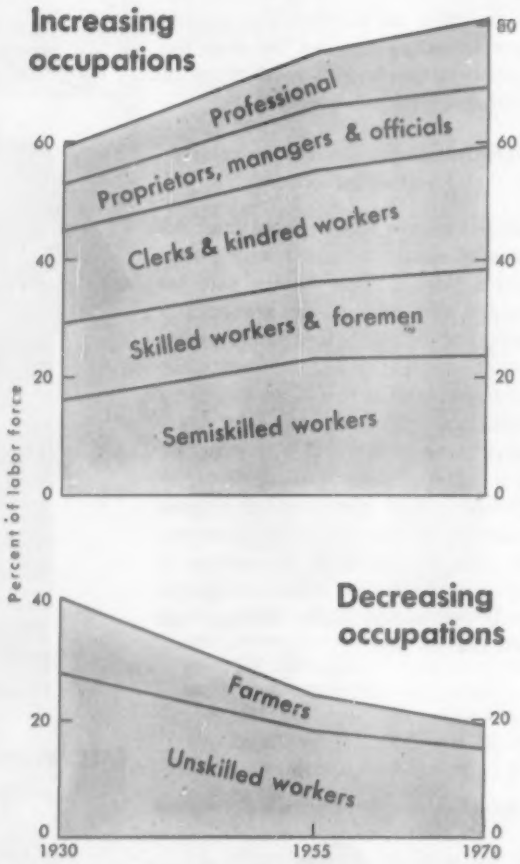
- 26% reported increases in employment averaging 21%
- 51% reported no change in total employment
- 23% reported decreases in employment averaging 16%

More Jobs for the Skilled

Of greater significance, however, is the response by 40% of these companies that they required more skilled maintenance men and by 21% of the companies that they had increased their engineering staffs. This indicates that automation is strengthening a trend already evident in the United States, a trend of expanding opportunity for those with industrial and professional skills and, relatively, of contracting opportunity for the unskilled.

The following chart shows how strong this trend has been over the past 25 years and how strong it may be expected to be over the next 15 years.

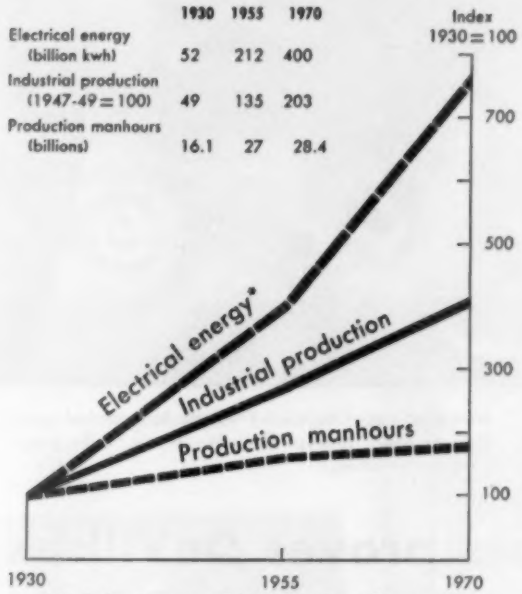
There has been a sharp decline in the percentage of unskilled workers in the nation's labor force and a corresponding increase in the percentage of those with varying degrees of skill.



It is possible, of course, to cite cases of individuals and groups that do not conform to the charted trends. Farmers, for example, are becoming at the same time more skilled and less numerous. But this does not upset the broad proposition that opportunities are increasing for those who have skills.

Power and Production

Much of the basic explanation for the relative expansion of opportunities for those with industrial and professional skills lies in the increasing use of power-driven machinery. This has made possible a vastly greater increase in manufacturing production than in the manhours of human labor devoted to it. The following chart shows the relative increases in electrical energy and manhours of labor used in manufacturing since 1930 and the rise in industrial production.

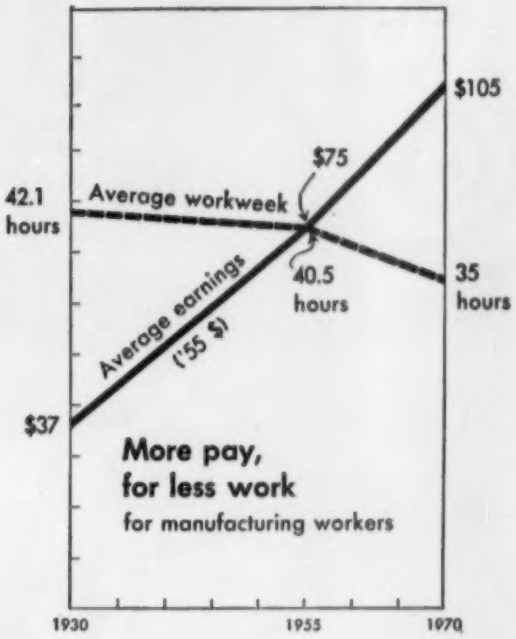


*Excludes power used in aluminum and magnesium reduction, both very heavy power users.

Power-driven machines have reduced the amount of human energy required for physical labor, but they have increased the need for skillful handling and maintenance. As the AMERICAN MACHINIST survey demonstrates, the same is true of automatically controlled machinery.

Higher Wages, More Leisure

The rising average wage of American industrial workers and the decline in hours per week that they must work reflect directly the extent to which the increase in industrial production has outstripped the manhours devoted to it. The final chart shows the increase in weekly wages (in dollars of constant purchasing power) and the decrease in the average workweek in manufacturing since 1930. It also shows the changes that may come in the next 15 years if present trends continue.



There are some who would slow what an earlier editorial in this series characterized as "the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control." In doing so, they might make the world safer for those with no skill. The far more constructive course is to welcome the expanding opportunities now being provided and be sure that the nation's young people, who are now starting another school year, are prepared to take advantage of them.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

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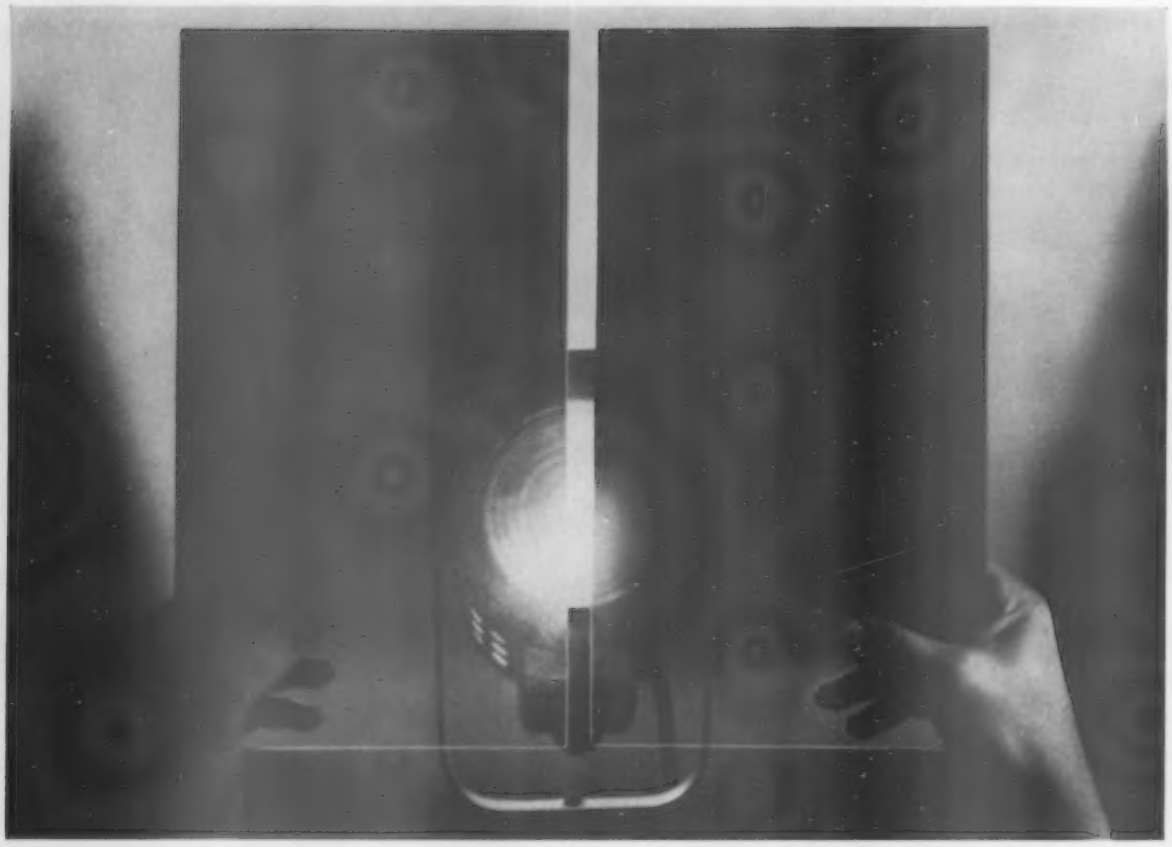
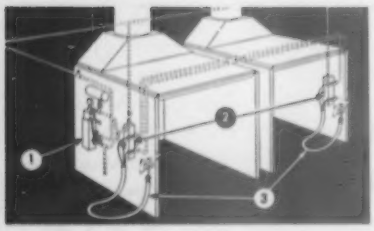


***Paint applied** to its maximum film thickness by the usual spray method (cold) looks like this in front of a powerful spotlight. Note coverage.*

***Same paint** applied by the DeVilbiss Hot-Spray method produces far greater coverage with a heavier coat, as the glass panel on right shows.*

Demonstration on glass proves DeVilbiss Hot Spray cuts finishing costs



DeVilbiss Hot-Spray system is foolproof; adapts to multiple gun hook-ups. Hot water from master heater (1) heats paint in exchangers (2); heat-jacketed hose assemblies (3) keep paint hot right up to guns, assuring uniform viscosity at all times at each gun.

Now, using a DeVilbiss Paint Heater, *one* coat sprayed *hot* generally covers better than *two or more* cold-sprayed coats! More paint reaches a surface *and stays there* . . . because thinning paint with heat – rather than with solvent – permits application of higher solid-content material for heavier coats and greatly reduced overspray.

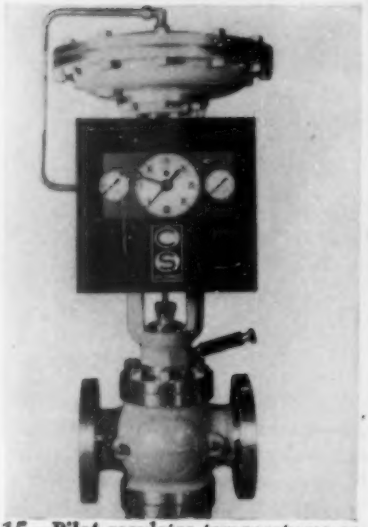
This superior finishing method saves up to 50% in material and labor costs; may be used on all types of products – from autos, furniture, and appliances to military tanks. For facts on how much the DeVilbiss Paint Heater can save *you*, call your DeVilbiss supplier!

THE DEVILBISS COMPANY
Toledo, Ohio
Santa Clara, Calif. • Barrie, Ontario
London, England
Branch Offices in Principal Cities

FOR BETTER SERVICE, BUY
DEVILBISS

***Write for Bulletin 1E-114 for complete data on* DEVILBISS HOT SPRAY**

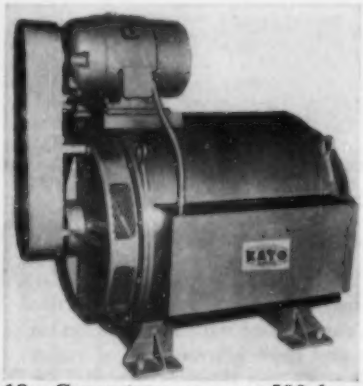
For more about these products, circle item numbers on Reader Service Card next to back cover.



15—Pilot regulates temperatures as well as pressure. Type 51 is for pressure ranges of 15 to 10,000 psi., 0-30 in. water and 0-30 in. mercury vacuum; temperatures from –40 to 1000 deg. F. Separate or mounted on maker's control valve. Three pressure-sensing elements available. *A. W. Cash Co.*

16—Magnetic Counter is for moderate duty, where extreme long life is not required. Easily connected in series with any device with contact arrangement. Actuated by any switch, relay, photoelectric unit. 700 counts per min.; 3 or 4 figures. *Veeder-Root Inc.*

17—Portable Electric Tool combines jig-saw, router, jointer and shaper table. Model 140 "Routo-Jig" handles regular cut-off work, plunge cutting, intricate contours and freehand shapes. Operates in any position. Weighs 4 lb.; 1/3-hp. Collet turns at 24,000 rpm. *Porter-Cable Machine Co.*



18—Generators range to 500 kva. Pictured above: unit for 500 kva., 400 kw., three-phase, 60 cycles, 1200 rpm., 220/440 volts. Made with overhead belted or direct-connected exciter. Available in single-bearing design. To 2300 volts. *Kato Engineering Co.*

19—Coastal Finish Paint is available in three handy spray cans—one each for prime, intermediate, and finish coats. Convenient, simple way to touch up transformers, pole-mounted or on ground; to paint hard-to-reach spots. *Westinghouse Electric Corp.*

Turn the page

Cut Compressed Air Costs!

Cast-iron, *finned inter-coolers on DeVilbiss compressor outfits lower the air temperature between the first and second compression stages, and provide extra cooling. Result: much higher efficiency and greater air output.*

The biggest cost in compressed air is the operating cost. DeVilbiss air compressors save on power, upkeep, and depreciation. By actual tests, DeVilbiss air compressors deliver up to 22.6 percent more air per power dollar. In fact, many times they pay for themselves in power savings alone.

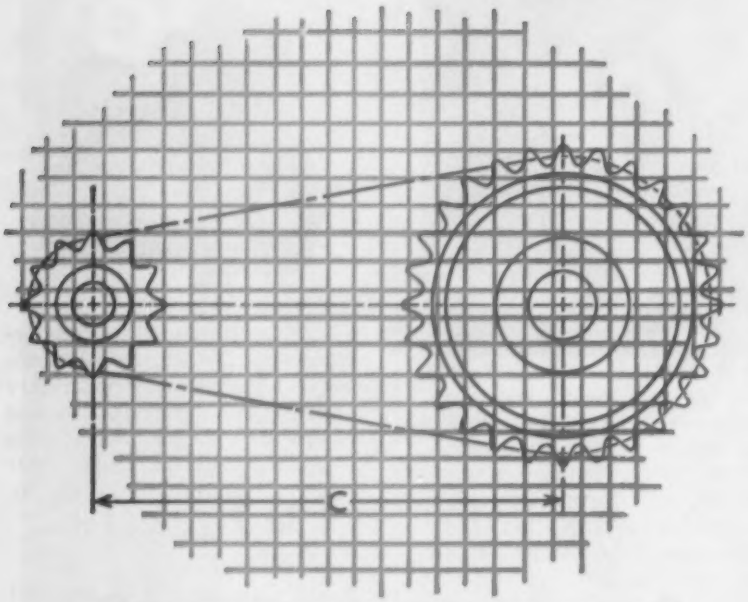
In addition to inter-coolers, every DeVilbiss compressor includes these features: automatic pressure switch, A. S. M. E.-approved tank, check valve manifold, diamond-bored pistons, cylinder head with removable valves, quality electric motor or gas engine.

Contact your local DeVilbiss jobber for a complete analysis of your compressed air needs.

THE DEVILBISS COMPANY
Toledo, Ohio
Santa Clara, Calif. • Barrie, Ontario
London, England
Branch Offices in Principal Cities

FOR BETTER SERVICE, BUY
DEVILBISS

Designers! Determine this Chain Length



GIVEN:

Teeth in small sprocket	17
Teeth in large sprocket	78
Center Distance	36″
Pitch of Chain	1″

To find — Chain length in inches. *(Answer below)*

Answer: 96.354 inches

Acme Chains latest 76 page catalog brims with chain data. Filled with information on the correct and most efficient use of roller chain, cable chain and all types of sprockets. Among many other things it gives you the correct formula for computing proper chain lengths.

***FREE** to Engineers and Designers. Write Dept. 13A, ACME CHAIN CORP., Holyoke, Mass.*

Write or Call JE 2-9458 for immediate chain delivery or free engineering service.

Acme Chain Corporation
HOLYOKE
MASSACHUSETTS

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.

20—Exhaust Fan is a rugged, heavy-duty propeller type. Model K Ventura available with two-speed or constant-speed, direct-drive totally enclosed motors. Operates against static pressures to ⅝ in. Sizes with capacities of 587-12,800 cfm. *American Blower Corp.*

21—Oil-Hydraulic Power Units are compact, flexible, have manifold mounting of control components. Series T8 are for light duty, such as clamping, indexing, transfer operations. Pipeless packages meet JIC standards; motors meet NEMA frame sizes. *Vickers Inc.*

22—Circuit Breaker, L frame, molded case, has new interrupting rating of 50,000 amp. (asymmetrical rms.) at 240 volts a-c—a 25% increase over previous rating of 40,000 amp. at 240 volts a-c. Application flexibility; cost savings. *General Electric Co.*

Turn the page

Years of service. Long, trouble-free life is assured by K&M Corrugated Asbestos Sheets. They are used on the roof and sides of this building at the Osgood Company, Marion, Ohio. Application Contractor: Elwin G. Smith Co., Toledo, Ohio.

CUT MAINTENANCE COSTS

with K&M Corrugated Asbestos Roofing and Siding

When K&M Corrugated Asbestos Sheets go up, upkeep expenses stay down. They never need protective painting, require little or no maintenance.

Really rugged. These sheets are strong, dense, and tough. Made of asbestos fiber and portland cement, they won't burn, rot, or corrode. And they're highly resistant to extremes in weather.

Big savings. These corrugated sheets make possible low application costs—they need only a minimum of cutting or fitting. And they offer the extra money-saving feature of needing little or no upkeep.

Send for details. At your request, we'll gladly send complete data on K&M Corrugated Asbestos-Cement Sheets. Write today.

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

K&M best in asbestos®

AFFILIATE OF GENERAL CERAMICS CORPORATION

Magnetic Amplifiers · INC

—announces its new

VARIABLE SPEED DRIVE

MAGNE-SPEED*

SIZE II — 3/4, 1 and 1-1/2 HP

SIZE I — 1/4, 1/3 and 1/2 HP

Stepless, instant starting, compact, 50:1 speed range, good regulation without tachometer, long life, virtually maintenance free service, low cost, fast response, reversibility, dynamic brake, local or remote control. Write for Bulletin S580-5-55.

Other MA Products and Services

Magnetic Servo Amplifiers
Transi-Mag * Amplifiers
Analog Computors
Photoelectric Controls
DC and AC Regulated Power Supplies

• Trade Name

Application engineering and conversion of tool machines and production processes to automatic control.

Magnetic Amplifiers • Inc

Tel. CYpress 2-6610 • 632 TINTON AVE., NEW YORK 55, N. Y.

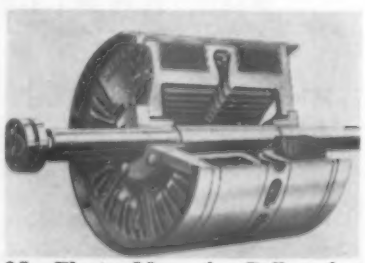
FACTORY / EQUIPMENT NEWS

Begins on page 160

For more about these products circle item numbers on Reader Service card next to back cover.

23—Personnel Carrier is ideal for plant tours, for intra-plant movements. Four air cushion seats can be removed to convert to freight carrier. Battery-powered; quiet, fume-free. Capacity is 2000 lb.; top speed 6 mph. with full load. *Lewis-Shepard Products, Inc.*

24—Sanitized Pulley has 5/16-in. thick molded cover of plastic—no cracks or crevices; no exposed metal other than stainless steel shaft. Clean with steam or hot water. Cannot corrode: resists acids, oils, alkalis, grease; odorless. *Mercury Conveyor, Inc.*



25—Electro-Magnetic Pulley has new 2-coil design that enables removal of more tramp iron than ordinary larger units. In many cases, 2-coil pulley of smaller diameter than 3-coil pulley handles same job, reducing equipment and power costs. *Stearns Magnetic, Inc.*

Turn the page

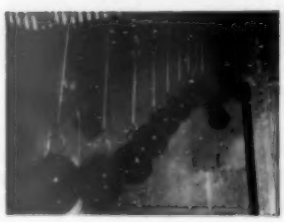
"CITIES SERVICE STAMPED OUT 25% OF DIE MAINTENANCE LABOR COSTS"

"Increased tool life 50%, lowered production costs," says the Toledo Pressed Steel Company. Fabricating 600 to 700 tons of steel per month, Toledo Pressed Steel is one of the largest stamping companies in Toledo, Ohio. From its 78 punch and draw presses, ranging from five to 500 tons, come truck flares, road construction torches, radio and television parts, and stampings for the automotive industry.

Volume operation? You bet! . . . the kind where the right lubrication makes a big mark in the profit column. And the right lubrication for Toledo Pressed Steel has been Cities Service Lubrication.

Says Plant Manager Walter Baird: "We have been using Cities Service drawing oils for nine years on all drawing and stamping operations. Previously we used several different compounds. But now with Cities Service drawing oils, we have increased tool and die life 50%, which, of course, has lowered production costs. In addition, they have reduced die maintenance labor costs about 25% compared to our former oils, and offer the bonus of easy removal from stampings where plating is necessary."

A Cities Service Lubrication Engineer can help you achieve similar results in your operation. Why not call him in. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



Road Construction Torches are one of the many products of Toledo's 78 punch and draw presses. These torches cost less to produce due to firm's use of Cities Service drawing oil.

Plant Manager Walter Baird with some of company's products . . . construction flares, metal stampings for automotive manufacturers and numerous radio and television parts.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

seals terrazzo floors dirt-tight— cuts maintenance cost to rock bottom!

New Holcomb T-GUARD actually *penetrates* terrazzo and provides a tough, invisible surface seal that defies dirt and traffic. It seals so tight that daily dirt is easily *swept* away. Practically eliminates time-consuming, high-cost scrubbings; drastically reduces number of wet-moppings needed.

T-GUARD also:

- **Is anti-slip . . . not a wax or varnish.**
- **Never needs buffing . . . has rich sheen.**
- **Enhances floor beauty . . . it's transparent.**
- **Lasts months . . . prevents stains, wear.**

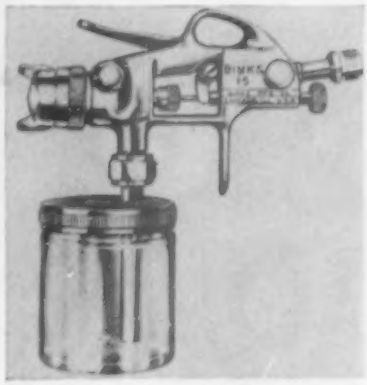
Let your Holcombman demonstrate how T-GUARD can save labor and material costs on *your* terrazzo floors.

Scientific Cleaning Materials

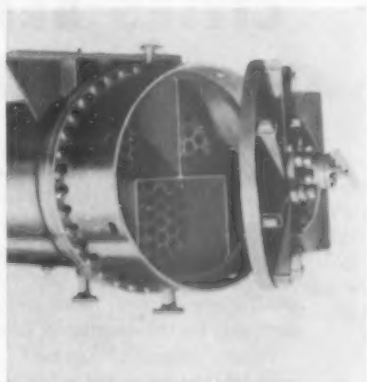
J. I. HOLCOMB MANUFACTURING CO., Inc.
1601 Barth Avenue, Indianapolis, Indiana
NEW YORK DALLAS LOS ANGELES

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.



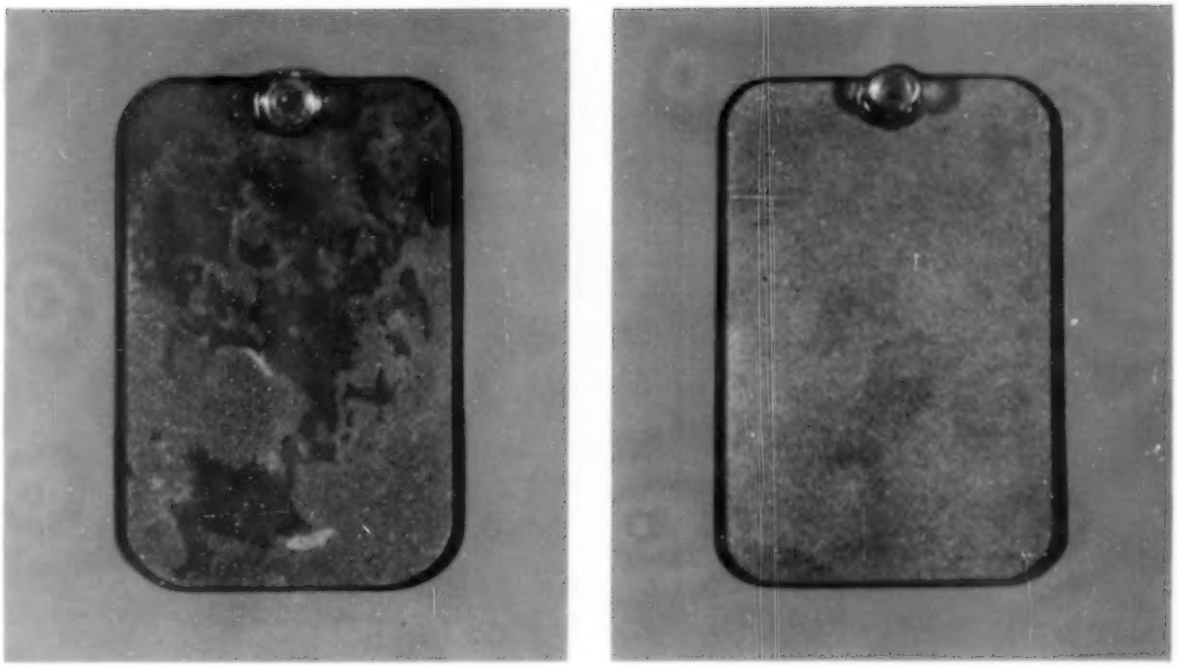
26—Spray Gun is for touch-up work and shading. Air line is at back instead of side. Puts weight of hose on arm where it can be easily supported, permitting more precise work without annoying, dangling hose. Easier to reach into awkward spots. *Binks Mfg. Co.*



27—Quick-Opening Door for heat exchangers, autoclaves, sterilizers, other pressure vessels, opens in 5 seconds by means of bars; while bolted doors take an hour or more. Withstands temperatures –70 to 400 deg. F.; pressures full vacuum to 300 psi. *Patterson-Kelley Co.*

28 — Fluorescent - Mercury Lamp, 400-watt, semi-reflector, is ideal for dirt-laden atmospheres. Built-in reflector reduces amount of light ordinarily dissipated by dirt-coated reflectors. Phosphor coating promotes good color quality. *Westinghouse Electric Corp.*

Turn the page



Efficiency of New Sun Rust-Preventive Grease is shown by accelerated test. Rusted test plate (left) was coated with ordinary grease. The large amount of rust was formed during a 48 hour immersion in synthetic sea water. Plate (right) protected by new Sun rust-preventive grease is wholly rust free after 48 hours.

NEW GREASES PREVENT HARMFUL RUST

Sun rust-preventive greases give improved lubrication ...protect against wet or humid operating conditions

In 48 Hour Synthetic Sea Water Test, rust from plate coated with ordinary grease has turned water yellow (left). Water remains crystal clear in beaker with plate protected by new Sun rust-preventive grease (right).

Water contamination in grease-lubricated parts reduces lubricant life, promotes corrosive wear, and may lead to failure of bearing surfaces.

Sun Oil's new rust-preventive greases are specially fortified to overcome this problem. They give extra protection against both direct water contamination and indirect water contamination caused by high humidity and condensation during overnight and week-end shut downs.

Available at the price of ordinary greases, new Sun rust-preventive greases come in many different grades. For complete information, see your Sun representative, or write for Sun Technical Bulletin 38. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. GI-1.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO & MONTREAL

SUNOCO

PLEASE TURN TO NEXT PAGE

New buttery grease now protects against rust under highly adverse moisture conditions.

New tacky grease prevents throw-off... reduces consumption. Highly resistant to water.

New high-temperature grease for anti-friction bearings. Exceptional stability, longer life.

NEW SUN RUST-PREVENTIVE GREASES SAVE YOU MONEY IN 3 WAYS

- **Prevent wear... and rust... on 90% of all grease jobs**
- **Serve as low-cost rust preventives for storing shop equipment**
- **Save storing and handling special-purpose greases**

Sun Oil Company's new greases are fortified to protect against rust. Lubricity is improved and wear is reduced because grease-lubricated parts are now protected at all times against rust and corrosion caused by condensation and process water.

The effective life of these new rust-preventive greases is approximately twice that of conventional greases operating under wet conditions. And, their extra protection against moisture permits their use as a rust-proofing medium for shop storage of tools and parts.

Competitively priced with ordinary greases, these new greases can be applied by any conventional method... brush, swab, pressure gun, or through central pressure systems.

Because of their improved quality, these new Sun greases will now perform 90% of all grease lubrication jobs. You reduce grease inventories ...lessen the risk of using the wrong grease... simplify your handling problems.

For complete information, see your Sun representative or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. GI-2.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY, PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

For more about these products, circle item numbers on Reader Service card next to back cover.

29—Deflection Indicator is for any shafted machinery, such as pipeline pumps and compressors. Operates on balanced bridge principle. Consists of two compact inductor-coil pick-up units and control assembly; has no electronic tubes. *Allis-Chalmers Mfg. Co.*

30—Ratchet Lever Hoists with coil chain use levers instead of gears. Greater efficiency, compactness, safety, lighter weight. 1½-ton capacity single-chain model; 3-ton double-chain. Double chain easily converts to single. Iron or aluminum. *Coffing Hoist Div.*

31—Hydraulic Power Pump operates and precision-controls all types of hydraulic equipment. Features single replaceable valve cartridge that includes main check, release, by-pass relief valves. Discharge: 50 cu. in.; pressure: 7000 psi. *Columbian Vise & Mfg. Co.*

Turn the page

USE ARCO RAYS MILL WHITES . . . OPTONIC® WALL COLORS

Good fog control is characteristic of the entire line of Arco Rays Mill Whites. Fast drying and minimum clean-up permit application without costly interruptions in factory routine. In particular Arco Rays with Fog Control Alkyd Flat, when applied at recommended pressure, produces practically no mist. Even at higher pressures, any spray dust dries while it's airborne . . . can be swept up as soon as it hits the floor.

The dense titanium pigmentation in these paints means one-coat coverage over the dingiest surfaces . . . even black . . . with minimum surface preparation.

With the advent of modern plant lighting, factory interiors no longer need be completely white. Arco can recommend, from its Optonic Color System, functional, harmonious colors scientifically selected to relieve eye strain and boost employee morale . . . colors that promote efficiency and good housekeeping.

Streamline your plant painting program and get the utmost for your maintenance dollar with Arco Rays Mill Whites and Optonic Wall Colors. For further information send the coupon below.

TESTED FIRST TO LAST

Snap-on*

HEAVY DUTY LOXOCKETS

SET 432-HD-B

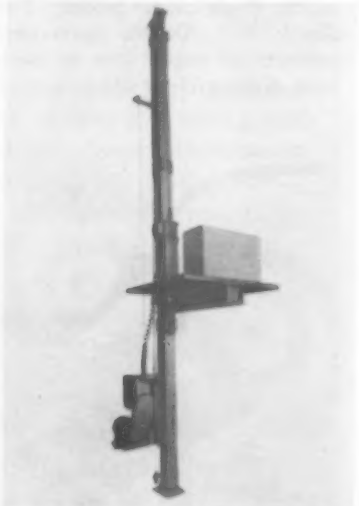
POWER FOR THE TOUGH JOBS! This is the wrench set to have at hand for the jobs that require size and power and sweeping leverage. These tools give *speed* as well—the big handles, adaptors and sockets are sleekly proportioned, versatile and fast working. The more powerful the wrench, the more you want *safety*—and Snap-on provides it—with positive button locking of units to give the security of a one-piece tool. The Loxocket release pin gives fast interchangeability of units. Available through your nearby Snap-on factory branch. For Snap-on industrial catalog, and 104-page general catalog of 4000 hand and bench tools, write

SNAP-ON TOOLS CORPORATION
8044-K 28th Avenue
KENOSHA, WISCONSIN
*Snap-on is the Trademark of Snap-on Tools Corporation.

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products circle item numbers on Reader Service card next to back cover.

32—Bleeder and Dispenser for hydraulic fluids is a portable, sealed pressure unit, requiring no air connection. Low price makes it practical to equip each mechanic's station with one. Suitable for emergency service. Pressure to 15 lb. *Ekco Products, Inc.*

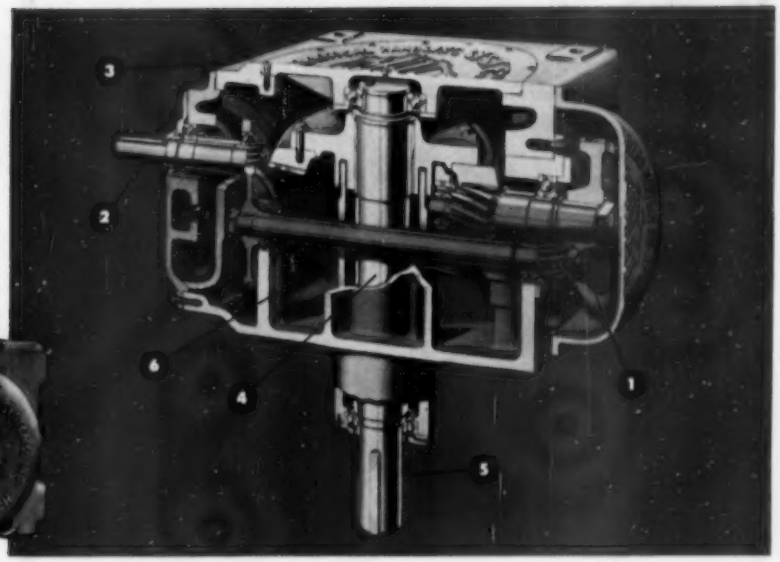


33—Hoist is ideal for semi-permanent handling. Consists of platform which rides on single column, occupying small area. Two men can erect it in three hours. Vertical monorail builds upon self to any height; disassembles to 6 ft. or less. *Hawkeye Engineering Co.*

Turn the page

36 SPEED REDUCERS IN 1

36 speed changes
•
8 positions



MHS MULTI-RATIO DRIVES

With change gears and high speed heads, this one MHS Multi-Ratio Drive is equivalent to a whole stock of reducers! Now, instead of dismounting and replacing an entire unit when changes in production or processing speeds are necessary, simply replace the change gears or head. No mechanical changes required to shift reducer shaft from up to down position.

Save time, labor, and inventory!

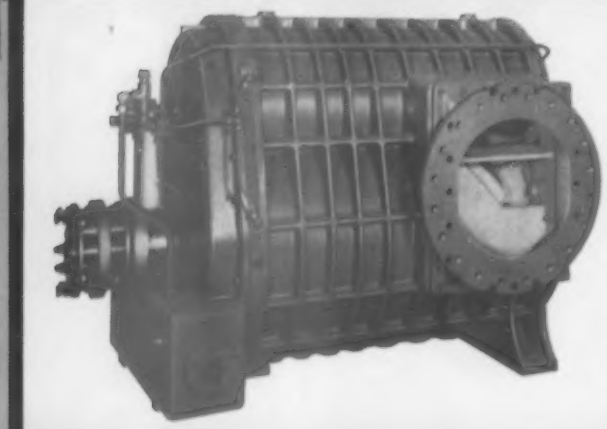
MHS Multi-Ratio Drives operate with mechanical efficiencies of 94% to 97% at full rated torque.

Write for illustrated catalog D2 with full engineering data.

1. **Change gear sets, in six different ratios, simplify minor speed changes. Installed in minutes. Stocked for immediate shipment.**
2. **Large variations in ratio possible at input shaft by use of six interchangeable high speed heads of single, double or triple reduction.**
3. **Heavy walled cast iron housing is dust and moisture proof.**
4. **Leakproof performance assured by drywell construction of output shaft.**
5. **Oversize alloy steel output shaft with anti-friction bearings can be operated in eight different positions.**
6. **Large volume of oil circulates rapidly, keeps unit cool.**

Mechanical Handling Systems Inc.
AND SUBSIDIARIES
4608 Nancy Avenue • Detroit 12, Michigan
Offices in Principal Cities
FACTORIES: Detroit; Mich. • Fairfield, Iowa • Albany, N. Y. • Windsor, Ontario

OIL IS... WONDERFUL



but not when it contaminates compressed air or gas

The Standardaire Blower assures you of absolutely oil-free compressed air or gas. It delivers totally clean air or gas, thanks to a superior oil sealing arrangement.

This is just one of the many advantages offered by the Standardaire Blower. This rugged, compact unit provides greater capacity per pound of blower, with less power consumption.

How? Through its exclusive cycloidal, screw type rotors which compress air in a modified adiabatic cycle. The air is taken in and discharged smoothly from pockets which form between the rotors.

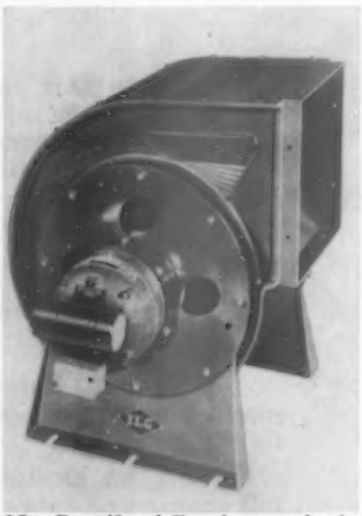
There's a Standardaire Blower for your requirements . . . either low, medium or high capacity. Write today for further facts and information.

READ STANDARD
CORPORATION

BLOWER-STOKER DIVISION
370 Lexington Avenue, New York 17, New York

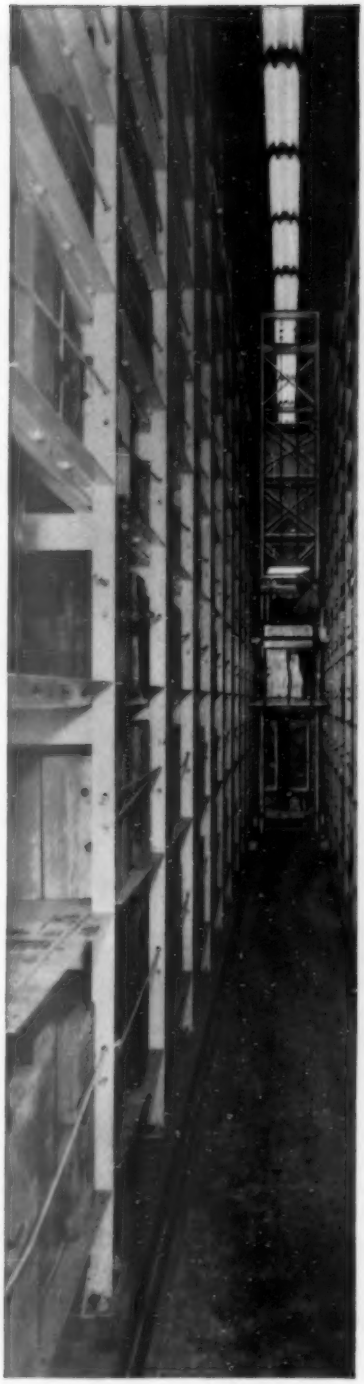
For more about these products, circle item numbers on Reader Service card next to back cover.

34—Detector is a portable, electronic instrument that locates faults and bearing failures in motors, machinery; leaks in pipelines; surface flaws in many materials. Can measure volume of flow in pipelines; determine sound absorption of materials. *John Ould (USA), Ltd.*



35—Centrifugal Fan features backward-curved, all-aluminum airfoil blades that produce complete freedom from air flow separation at all normal working pressures. Results in high efficiency, quiet operation. Six sizes, three finishes. *Ilg Electric Ventilating Co.*

Turn the page



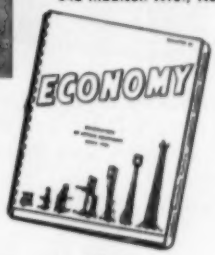
A 3000 lb. die handled like a feather with these special Economy die-handling Lifters

Push-button control for elevating the platform, propelling the machine down the narrow aisles, and moving the dies in and out of the racks, gives finger-tip high speed handling. The storage capacity is multiplied ten times the floor area and with every die located for immediate selection.

This die handling system, Economy engineered and built, is an example of how materials handling problems can be solved by Economy engineers who have specialized in custom-built machines for over 50 years.

Our representatives, trained in engineering, are located in all principal cities. Why not call one in on your material handling or overhead servicing problem?

ECONOMY ENGINEERING CO.
4529 W. Lake St., Chicago 24, Ill.
New York Office
342 Madison Ave., New York 17, N. Y.

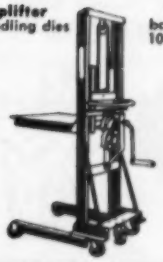


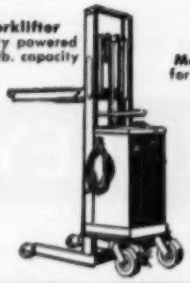
Write for new Catalog No. 55 Forty pages of pictures and suggestions for special and standard machines. Every plant manager and maintenance engineer should have this catalog.

Economy makes a complete line of standard lifters

Barrel Racks

Elevating Table


Shoplifter for handling dies


Worklifter battery powered 1000 lb. capacity

Model PUL for overhead service

Hi-Reach telescopers up to 100 ft.

Stanley Electric Hammer Speeds Up Maintenance and Construction Jobs

The Stanley Electric Hammer is a powerful, light weight, well balanced tool. It is used to drill, chip and channel in concrete, stone and brick . . . to chisel wood . . . to scale rust . . . to tamp concrete . . . to do every hammering job. Wherever it is used the Stanley Electric Hammer speeds up the job – in some cases it is 32 times as fast as hand hammering.

THREE KITS TO CHOOSE FROM

No. 310A — *Drilling kit with hammer, carrying case, chucks that take drills from 3/16" to 1-1/8", star drill and lubricant.*
No. 312 — *Scaling kit with hammer, 4 chisels, tool retaining clip and carrying case.*
No. 311 — *Scaling kit with hammer, tool retaining clip and carrying case.*

FULL LINE OF ACCESSORIES

A complete line of hammer accessories includes chisels, star drills, bull point, bush hammer, gouges, dust shield, chucks and tool retaining clip. See your industrial distributor or write Stanley Electric Tools, 34N Myrtle St., New Britain, Conn. Ask for Catalog 12.

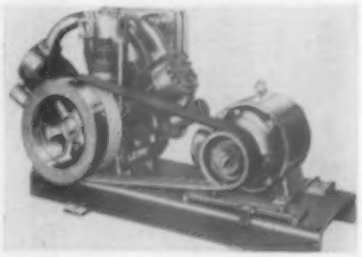
STANLEY

The Stanley Works • New Britain, Conn.

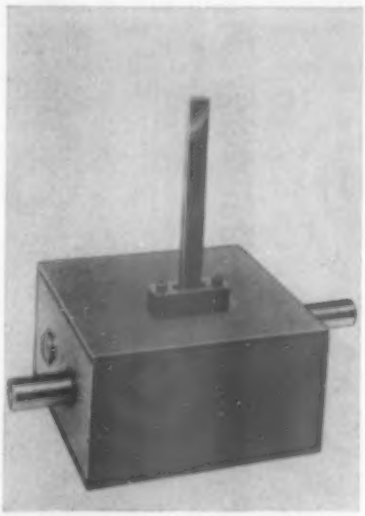
TOOLS • ELECTRIC TOOLS • HARDWARE • STEEL • STEEL STRAPPING

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products circle item numbers on Reader Service card next to back cover.



36—Stationary Compressors are compact, lightweight, need little operator attention. Minimum vibration and noise. Two-stage, air-cooled, electric motor-driven units in 50, 75, 100 hp.; displacements of 260, 415, 550 cfm. operating at 125 psi. *Le Roi Div.*



37—Reversing Clutch Unit mechanically reverses from straight forward position any one-directional motion at full speed, eliminating shock. Can be 1:1 in forward and reverse, 2:1 at higher or lower speed than original. 3 hp. at 200 rpm. *Atlas Industrial Corp.*

38—Welding Ring, flat type, is for submerged arc welding of pipe and fittings, but suitable for many manual jobs. Small spacer pins (⅛-in. diameter) automatically and unfailingly center ring in joint; prevent shifting up or down stream; help align. *Tube Turns, Inc.*

Turn the page

Like Lifetime Protection?

GET NE Sherarduct

RIGID STEEL CONDUIT

LIFETIME CORROSION PROTECTION
•
EASY FISHING
•
ZINC PROTECTED THREADS
•
STRONG COUPLINGS
•
THOROUGH GROUNDING
•
EASY BENDING

Sherarduct Rigid Steel Conduit gives you lifetime protection against corrosion. Here's why:

First, NE's Sherardizing process of dry galvanizing alloys pure zinc with the conduit walls, fortifies the steel against rust and corrosion permanently. Second, Shera-enamel, a special, baked-on coating, further protects the conduit from acids and other corrosives.

This double corrosion protection covers the entire surface—inside and out, including the hills and valleys of every thread.

And there are other Sherarduct advantages:

Easy fishing for example . . . in addition to a smooth inside surface, Sherarduct's accurately cut threads let conduit ends butt inside the coupling . . . eliminate gaps that increase friction.

Sherardizing normalizes the conduit metal by gradual heating and cooling in an annealing-like process. This means easy bending and forming on the job.

Write for your free Sherarduct facts book . . . see how the Sherardizing principle makes Sherarduct "galvanized conduit at its best."

Listed by Underwriters' Laboratories, Inc.

Sherardizing is galvanizing at its best . . . Sherarduct is galvanized conduit at its best

50th

National Electric Products

PITTSBURGH, PA.

3 Plants • 10 Warehouses • 36 Sales Offices

You need a general purpose (emulsion or cutback) adhesive for asphalt tile and vinyl-asbestos tile. But a different one for rubber tile. And still another for greaseproof types of tiles.

Flintkote has them *all!* Exactly the right cement for holding each of these tiles firmly to the sub-floor or underlayment.

Use still *another* kind of specially formulated Flintkote adhesive for installing parquet wood flooring . . . as it *should* be installed.

And you also have a special group of adhesives to bond the different kinds of tiles to *walls*. One for ceramic tile. Another for polystyrene, metal . . . and other non-ceramic wall tiles.

Whatever you require in a floor or wall tile cement, Flintkote has it. Each Flintkote adhesive fills the bill . . . for moisture resistance, ease of application, cost and ability to *stick to the job*. Whether application is above or below grade.

So let Flintkote come to grips with *your* tile adhesion problem. Write for complete information about the full line of Flintkote tile cements.

FLINTKOTE

THE FLINTKOTE COMPANY, INDUSTRIAL PRODUCTS DIVISION
30 Rockefeller Plaza, New York 20, N.Y.

Boston .. Chicago Heights .. Detroit .. Los Angeles .. New Orleans .. Philadelphia

In Toronto, Ontario: The Flintkote Company of Canada, Ltd.
In London, England: Industrial Asphalts Company, Ltd.

FACTORY / EQUIPMENT NEWS

Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.

39—Miniature Jack is only 4-in. high when fully open, weighs 6 oz.; but it's no toy. Lifting capacity is over 1000 lb. Useful for leveling drill presses, milling machines, sections of printing presses, etc. Screw adjustment of 1 in. *General Hardware Mfg. Co.*

40—Rotary Trowel features control that stops rotating action instant operator lets go of handle, without stopping engine. 24-in. unit weighs 69 lb.—light enough for one man to carry; to put to work soon after laying concrete. For floating and finishing. *Stow Mfg. Co.*

41—Asbestos Sheet Packing handles steam, hot and cold water, brine, air, oil to 30 psi., 500 F. Strength of cross-laminated type is 4500 psi.; homogenous, 3000 psi. Thicknesses: 1/32, 1/16, 1/8 in.; sizes: 48x48, 48x72, 48x144 in. *Thermoid Co.*

Turn the page

New Money-Saving Airpower Anywhere in the Plant

Compact... Lightweight... Air Cooled

Le Roi Stationary Compressors are easily installed... anywhere

Take full advantage of every space in your plant where the economies of airpower can increase production and lower costs. How? By using Le Roi's two-stage, air-cooled stationary compressors that require a minimum of space, and are easy to install.

They're compact and lightweight. Moreover, these Le Roi compressors require no cooling water, eliminating the need for expensive space-eating pipes. There's no danger of freeze-ups or overheating from lack of liquid coolants. Only minimum attention by an operator is needed.

The new three cylinder 50S2, and six cylinder 75S2 and 100S2 compressors are balance-designed, reducing vibration and noise to a minimum. Available in 50, 75, and 100-hp sizes producing 210, 340, and 450-cfm capacities at 125 lbs. pressure, these new Le Roi airpower units offer low-cost operation, low-cost installation, and low-cost maintenance advantages for a wide range of needs.

For years Westinghouse compressors were the national favorite in the ½ to 40-hp size range. With the three new Le Roi sizes, an even greater range of dependable airpower is yours — up to 100 hp.

Write today for complete literature describing Le Roi's dependable, low-cost air supply.

LE ROI Division of Westinghouse Air Brake Co.

MILWAUKEE 14, WISCONSIN

Distributors in all principal cities

...here's why
BUSCHMAN
OVERHEAD CABLE
CONVEYORS
give you
GREATER SAVINGS!

LOWER INITIAL COST — Buschman "Universal" Cable Conveyors not only cost less but also outperform heavier, more expensive conveyors for light and medium-weight applications.

LOWEST MAINTENANCE COST — Constant take-up readjustment is eliminated because of a safety factor of 14-to-1 or greater.

LOWEST REARRANGEMENT COST — Exclusive Buschman design plus lightweight all-bolted construction make future changes fast and easy.

MORE COMPACT DESIGN — Shorter radius curves and dips permit more complete utilization of production and storage space . . . both overhead and at work level . . . require less room inside industrial ovens, washers, dip tanks, etc.

SMOOTHER OPERATION — There are no pulsations or jerks to damage delicate parts or finishes when your product is handled on Buschman Cable Conveyors.

PRE-ENGINEERED — Using Buschman standard stocked parts, your own crew can set up a "Universal" Cable Conveyor tailored to your specific requirements.

Write today for catalog.

PRODUCE MORE . . . FOR LESS
Buschman Conveyors

C-205-EWB

THE E. W. BUSCHMAN COMPANY
4425 Clifton Avenue • Cincinnati 32, Ohio

Begins on page 160

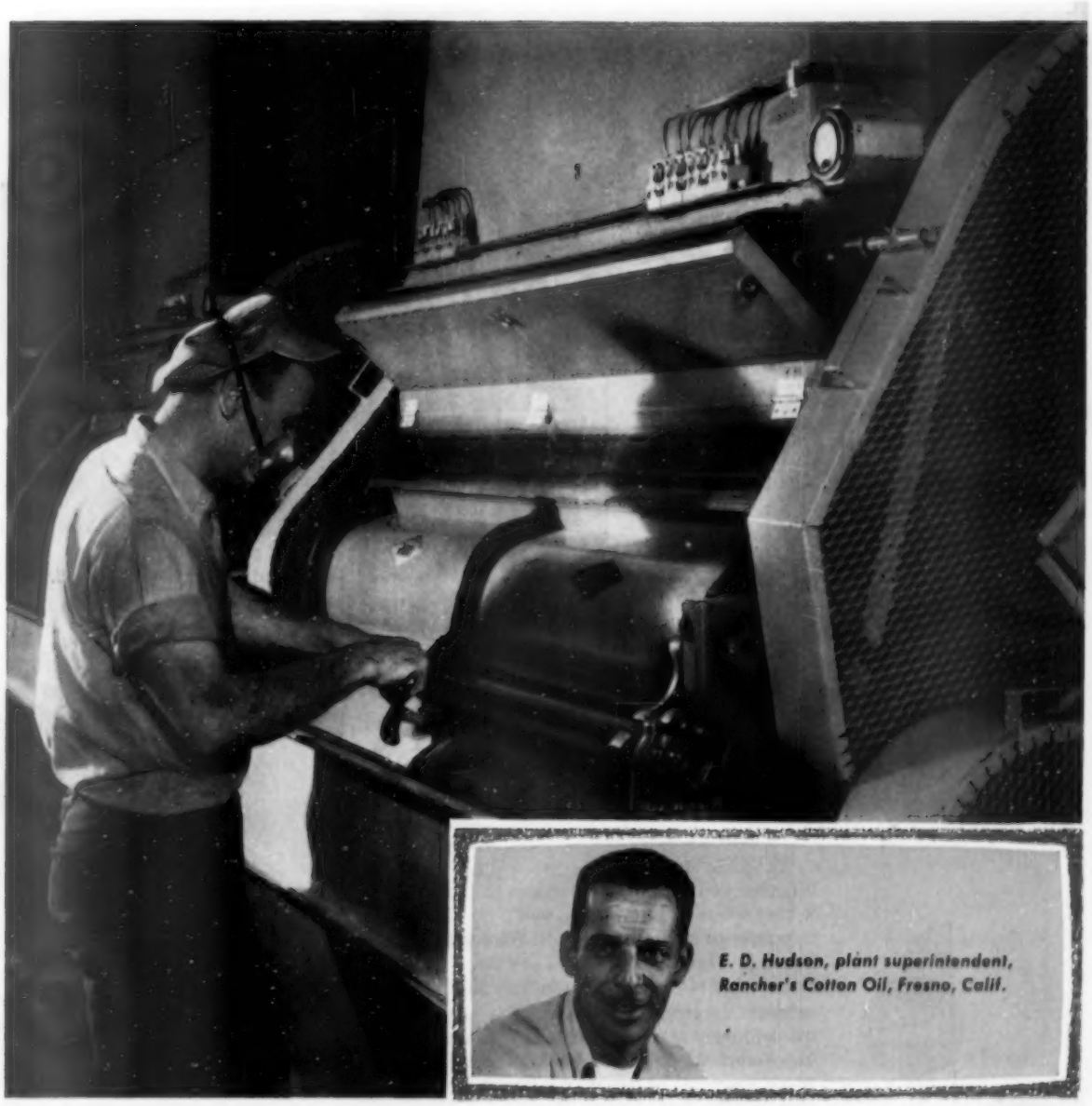
For more about these products circle item numbers on Reader Service card next to back cover.

42—Automatic Loader is for any automatic metal-finishing mechanism operating with intermittent motion. Size and weight of loaded racks need not be limited to workers' strength. Accommodates monorail conveyor operating on different planes. *Wagner Bros., Inc.*

43—Drum Handling Attachment, crab-type, fits all lift trucks. Grabs, holds, releases containers without use of power. Operates on gravity principle; controlled by operator. Simplicity eliminates maintenance. Easily installed. *Kughler Development Corp.*

44—Draft Cut-off Switch for automatic fuel-burning systems with motorized draft inducers provides timed pre-purge period and positive protection against draft failure, without shutdowns. No complicated changes in wiring. *Cleveland Fuel Equipment Co.*

Turn the page



E. D. Hudson, plant superintendent, Rancher's Cotton Oil, Fresno, Calif.

"Union's UNOBA Grease has solved a major problem for us—protecting bearings from linter dust."

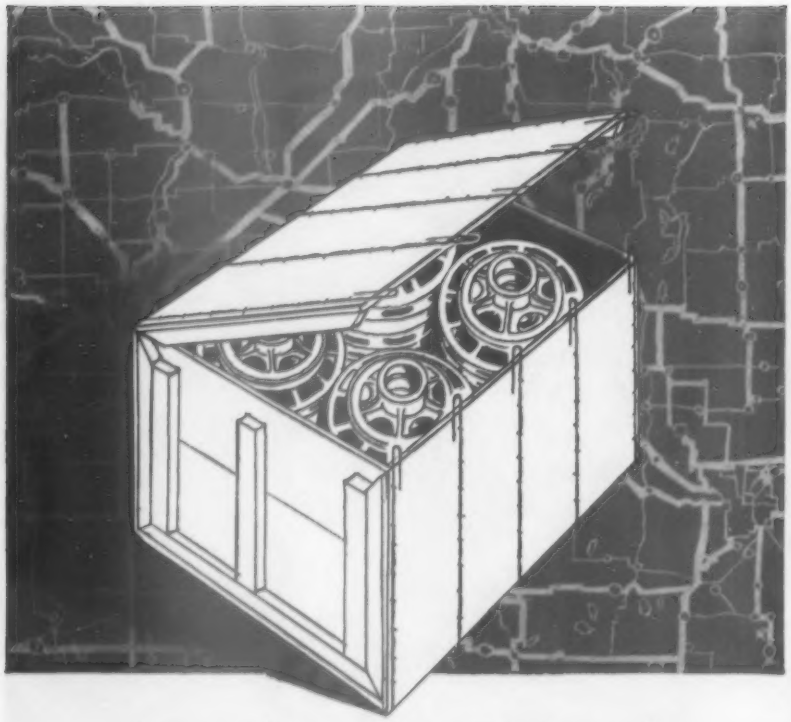
"Due to the material we process, 220 tons of cotton seed per day, cotton linter dust can be quite a problem where machinery's concerned. However, by using UNOBA Grease generally throughout the plant, we have practically eliminated trouble from this source.

"Take our Carver cotton linter machines – they're in operation 24 hours a day, seven days a week, 10 months out of the year. They have a total of 800 bearings which we automatically lubricate with UNOBA Grease, *and not one of these has failed in the past three years.* We think our preventive maintenance program is something to be proud of."

Mr. Hudson is right! And we're as pleased as he is about a record like that because it proves our point – UNOBA *affords the finest protection wherever dust conditions prevail.*

UNION OIL COMPANY 76
OF CALIFORNIA

Los Angeles: *Union Oil Bldg.* • **New York:** *45 Rockefeller Plaza* • **Chicago:** *1612 Bankers Bldg.* • **New Orleans:** *644 National Bank of Commerce Bldg.* **Atlanta:** *401 Atlanta National Bldg.* • **Kansas City, Mo.:** *612 W. 47th St.*



No matter where it's bound

SHIP IT WIREBOUND!

Whether you're shipping tractors to Brazil or taximeters to Buffalo you will *ship safer at lower total cost* in Wirebound Boxes or Crates. Wirebounds are the remarkable tailor-made containers that combine the strength of steel with the resiliency of wood to save tare weight. They come to you flat, take less storage space, assemble in less than a minute and consistently slash damage claims. Isn't this the shipping story *you've* been wanting to hear? Wirebound Sales Engineers will tell you the whole story of safety and savings for *your* product!

MAIL THIS COUPON NOW!

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Room 1168, 327 South LaSalle Street, Chicago 4, Illinois

☐ Have a sales engineer give me the whole story.
☐ Send me a copy of "What to Expect From Wirebounds".

Name_____
Firm Name_____
Address_____
City, Zone and State_____

FACTORY / EQUIPMENT NEWS
Begins on page 160

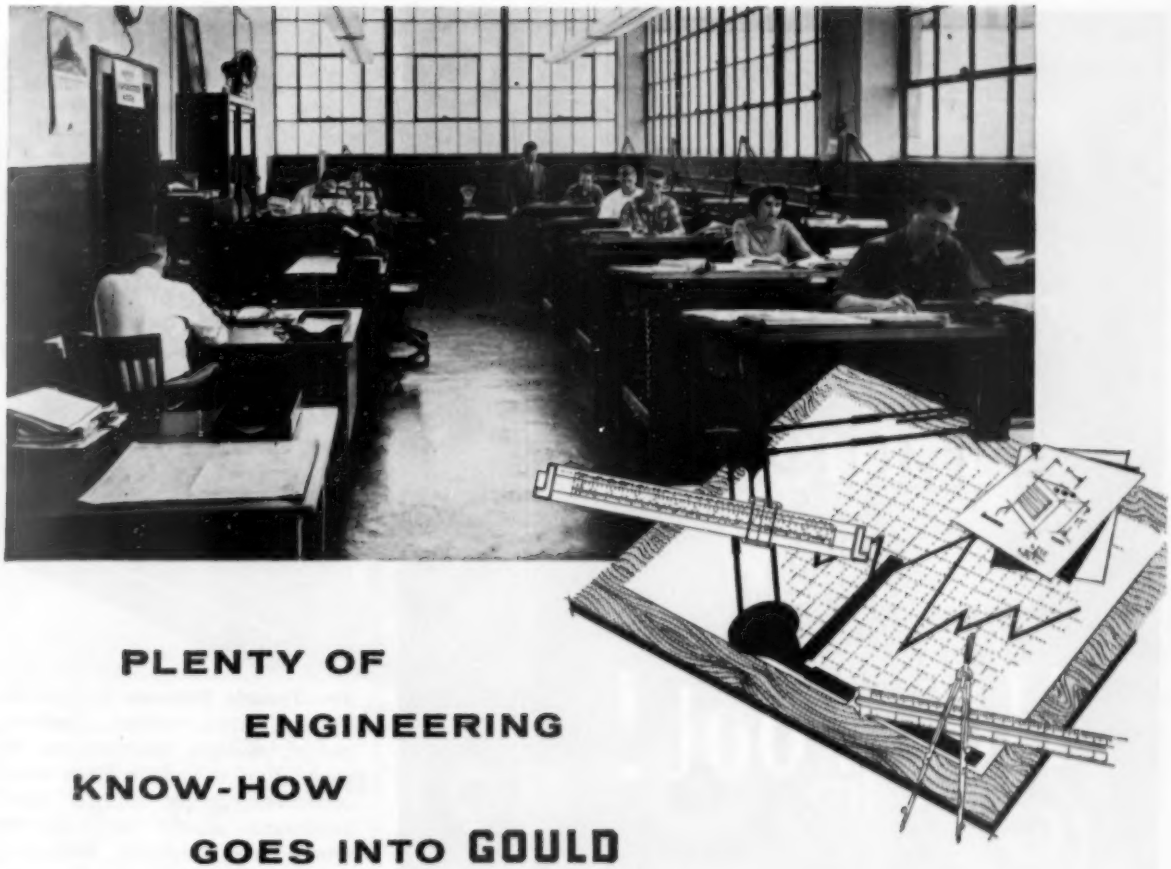
For more about these products, circle item numbers on Reader Service card next to back cover.

45—Strapping Machine is air-powered—takes effort out of tensioning steel strapping. Tensions, seals and cuts strapping in two easy motions. Ideal for skid and pallet loads. Just a few pounds heavier than hand-operated seal feed tool. *Signode Steel Strapping Co.*

46—Truck Leveler is built into pavement in front of loading dock, without costly alterations. Ideal where dock space is limited. "Adjust-A-Truck" hydraulically raises or lowers vehicle to dock level, even when on platform. Holds 40,000 lb. *Rowe Methods, Inc.*

47 — Enclosed Horizontal Motors are built to re-rated NEMA specs —compact, with more horsepower in less space. Fitted with NEMA Styles C or D face-type mounting brackets for direct connection to driven equipment. 1-30 hp. *U. S. Electrical Motors Inc.*

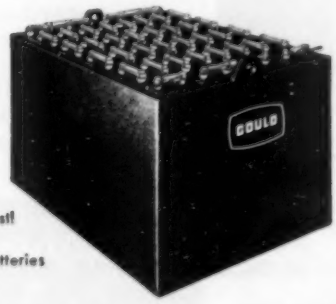
Turn the page



PLENTY OF ENGINEERING KNOW-HOW GOES INTO GOULD RESEARCH BUILT BATTERIES!

On the drawing boards in the Gould engineering department, theory is made practical. Drawings and specification charts indicate the right plate size, battery case size, the eventual battery capacity, how grids should be cast, how active material should be mixed and how the battery should be constructed—to make sure you get the right battery for the right job!

One more reason why you get better batteries first from Gould!



America's Finest!
GOULD
Industrial Truck Batteries

Always Use Gould-National Automobile and Truck Batteries

GOULD Batteries

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

"BETTER BATTERIES THROUGH RESEARCH"

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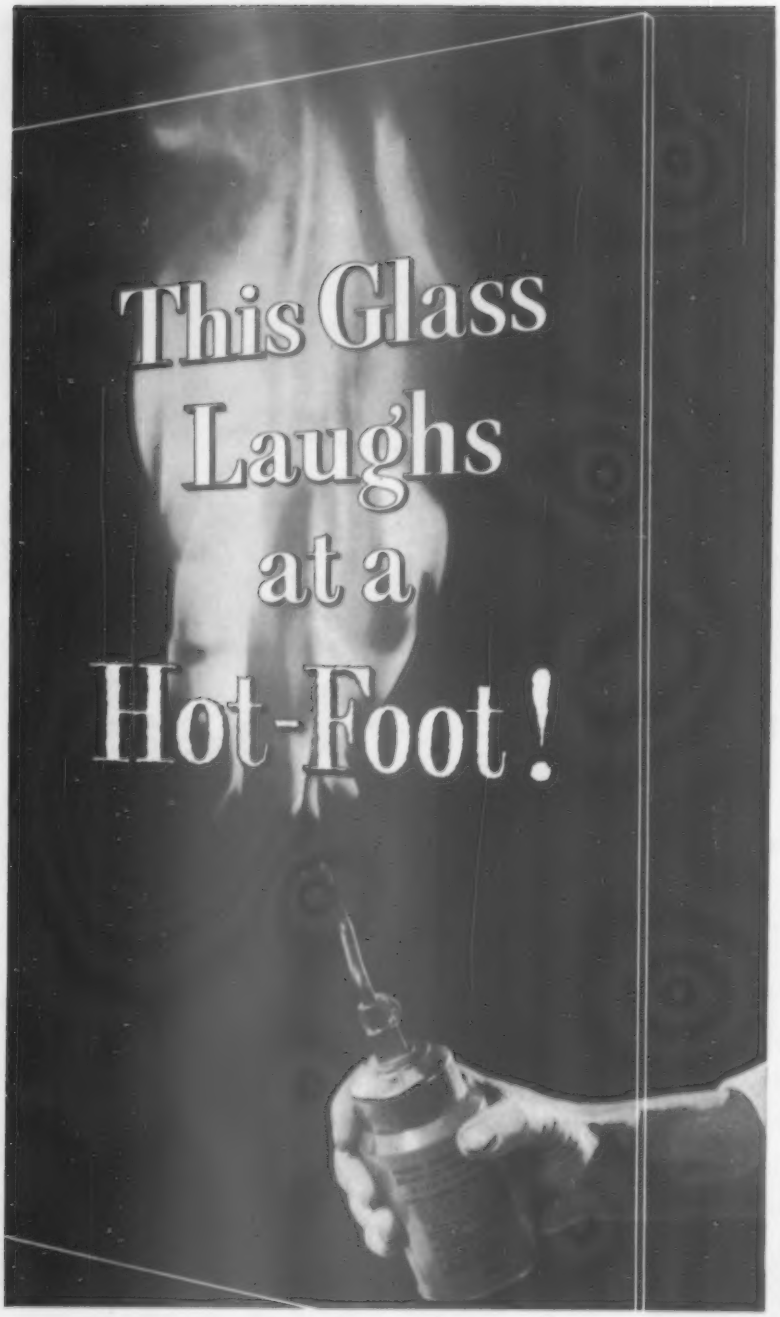


See this hand torch blast flame on the cold glass!

Some manufacturers use *Tuf-flex** as a window in a furnace. *Tuf-flex* tempered plate glass resists *300% more* thermal shock than regular polished plate glass of the same thickness.

Other manufacturers use *Tuf-flex* as a glass cover to protect certain mechanisms. ¼" thick *Tuf-flex* is so tough that a ½-lb. steel ball, dropped *10 feet*, bounces right off.

See all the ways you can use this glass to improve your product or production process

FOR YOUR FREE *TUF-FLEX* BOOKLET, TF-8, write Dept. 73115, Libbey·Owens·Ford Glass Co., 608 Madison Avenue, Toledo 3, Ohio. And order *Tuf-flex* from your local L·O·F Glass Distributor or Dealer . . listed under "Glass" in the yellow pages of phone books.

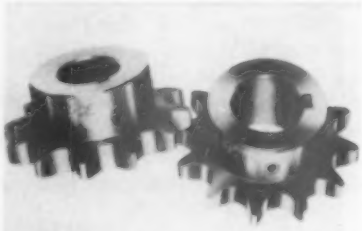
*®

L·O·F GLASS **LIBBEY·OWENS·FORD** *a Great Name in Glass*

For more about these products circle item numbers on Reader Service card next to back cover.

48—"Pump-Aid" prevents sticking of seasonally operated or auxiliary pumps. Coating is injected under pressure after draining pump. If impeller turns freely at this time, will start up again without sticking. Preserves neoprene, rubber, graphite seals. *Garman Co.*

49—Trouble Detector locates defects in motors, turbines, dynamos, pumps, pipelines, machines, etc., by sound. Easy to operate. Place sound conductor against suspect area, membrane against ear. Trouble sounds are amplified, indicating defect. *American Zerlon Corp.*



50—Roller Chain Sprockets, finished bore, can be quickly installed without reworking. Bores of single width, steel units are ⅝ to 2 3/16 in.; number of teeth per sprocket, 10-24 in ½- to 1-in. pitch. Interchangeable with other standard sprockets. *Morse Chain Co.*

51—A-C/D-C Welder is an all-purpose, single-phase unit for light fabrication welding. Continuous current range, full overload protection, portable. Provides a-c currents of 25-250 amp. or d-c currents 20-200 amp. Needs 230 volts. *Westinghouse Electric Corp.*

Turn the page

It's a Fact!

. . . Satisfied Craftsmen make better Fasteners at Lamson & Sessions . . .

Yes, you've heard it all before . . . happy, ideal conditions for the workmen, outstanding longevity records, three generations of the same family, etc.

BUT at Lamson & Sessions these things are more than a cause for pride . . . *they are a way of doing business.* From the apprentice machinist to the top echelons, you will find the same spirit of pleasant cooperation.

Because of this fact you, the customer, realize direct, tangible benefits such as better fasteners produced by designers who know their business, workmen who realize the importance of precise workmanship and salaried salesmen whose prime concern is customer service.

When you do business with Lamson & Sessions you just naturally become a satisfied customer of satisfied craftsmen.

We feel that this is the way of doing business that you prefer.

Lamson & Sessions

YOU GET MORE WHEN YOU BUY FROM . . .

The LAMSON & SESSIONS Co.

1971 West 85th St. • Cleveland 2, Ohio

CLEVELAND AND KENT, OHIO • BIRMINGHAM • CHICAGO

SCREWDRIVING

on production or maintenance work

for manual or power tool operation

you can do it better with APEX

APEX has these tools to help you:	if you drive these types of screws; PHILLIPS	FREARSON (Reed & Prince)	SLOTTED	CLUTCH HEAD	SOCKET HEAD
POWER BITS	X	X	X	X	X
HAND DRIVERS	X	X		X	
FEMALE SQUARE DRIVE BITS	X	X		X	
HAND BRACE BITS	X	X		X	
OFFSET DRIVERS	X	X			
FINDER SLEEVE ASSEMBLIES			X		
INSERT-BITS AND BIT HOLDERS	X	X	X	X	X
COMBINATION HAND DRIVERS	X	X	X	X	X
HAND BRACE BIT HOLDERS	X	X	X	X	X
FEMALE SQUARE DRIVE BIT HOLDERS	X	X	X	X	X

There are Apex screwdriving tools to fit all well-known makes of air, electric or spiral drivers . . . standard and magnetic bit holders . . . shanks and reversible sockets for use on hex head sheet metal screws. Complete information will be found in our Catalog 21—the authority on screwdriving; write, on your company letterhead please, for your copy.

APEX screwdriving tools

THE APEX MACHINE & TOOL CO.
1025 Patterson Blvd. • Dayton 2, Ohio

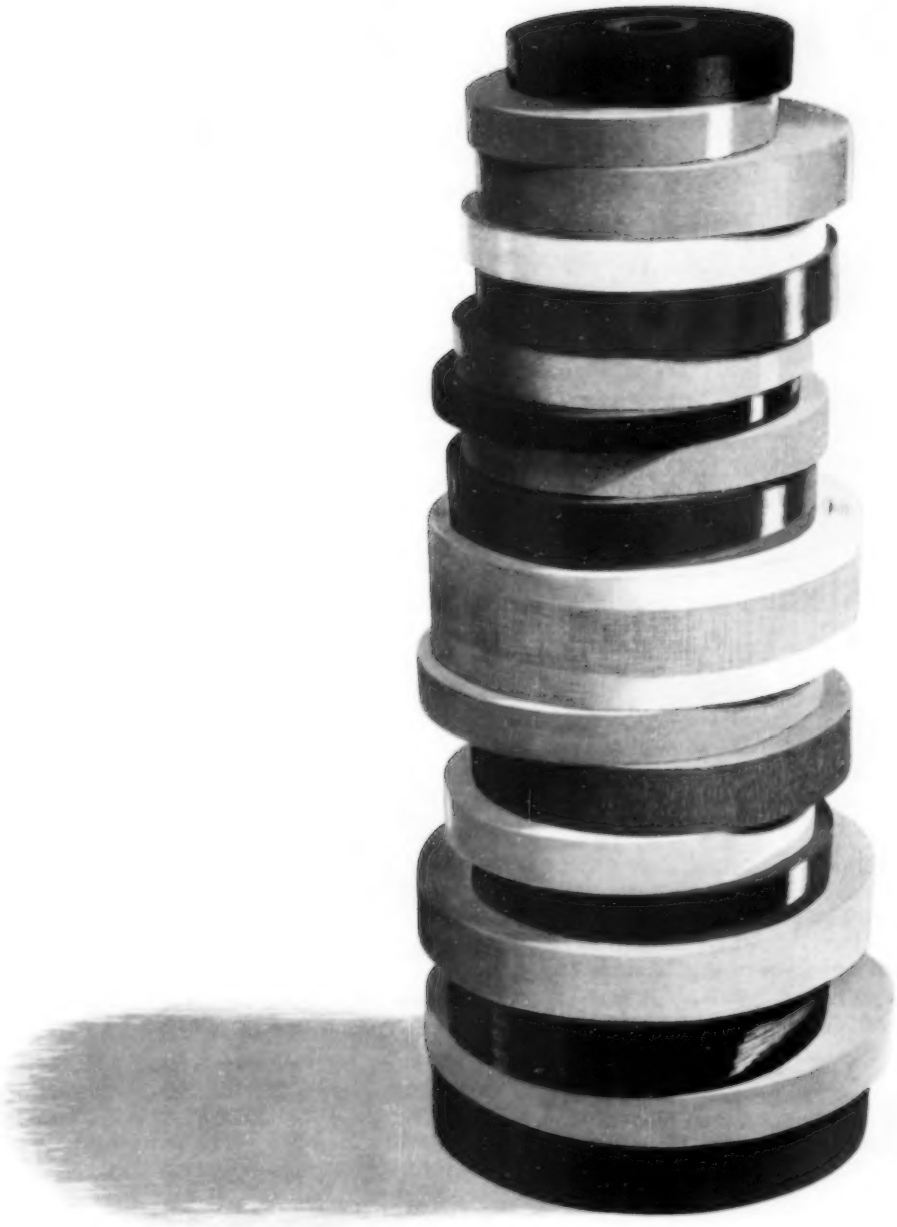
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.

52—Ratchet-Lever Hoist pulls or lifts any object in horizontal or vertical position, even upside-down, with minimum hook movement, permitting accurate machine placing and load spotting. Units are portable. Capacities: ¾, 1, 2, 2½, 5 tons. *Desco Corp.*

53—Table-Bench Unit has two tables, four benches, that fold in center, lock vertically into all-steel, caster-equipped carrier. "Mobil-Fold" provides lunch-hour seating, using minimum floor space. Folds to 6 ft. high. Seats 32 adults. *Schieber Sales Co.*

Turn the page



whatever the job . . .

SELF-STICKING

PERMACEL® TAPES

In our complete line, there's a self-sticking tape for every job — write Permacel Tape Corporation, New Brunswick, N. J.

a Johnson & Johnson company

Select a floor that gives you more... to meet your special needs

...Choose from these ever-beautiful Tile-Tex Products

For extra-special flooring effects... use Modnar or Holiday.

Modnar Random Plank Asphalt Tile is the first real change in asphalt tile. It's a plank-shape tile (24" long by 4" wide) in beautiful woodtone colors – Driftwood, Maple, Oak and Walnut. This new flooring development, an exclusive with Tile-Tex, has already become exceptionally popular for reception areas, corridors, recreation rooms, etc. Modnar is very economical to install, and waste material is reduced to practically zero because less than full size tiles add to the overall random effect.

Holiday Asphalt Tile is an exciting, new flooring made up of gay combinations of colorful dots. Color combinations are based on suggestions of one of the country's leading color stylists and designed to add to almost any decorative scheme. Installation is fast, due to the absence of directional pattern in the arrangement of the dots. Easy to keep looking attractive.

For "full-dress" floors of lasting beauty...use Flexachrome Vinyl-Asbestos Floor Tile.

Here are the most beautiful, up-to-the-minute tile colors you'll find. Plus one of the most practical, longest wearing floors ever developed. Flexachrome is greaseproof and resists acids, alkalis, scuffs, stains, fire, moisture. Waxing is not required. Flexachrome can pay for itself in maintenance savings!

About installation... All Tile-Tex floor tile products can be quickly installed on, above or below grade and over wood or concrete.

For an economical, greaseproof tile with light, bright colors... use Vitachrome Greaseproof Resilient Tile.

Vitachrome is a plastic-asbestos tile that is particularly excellent for kitchens and food serving areas. A favorite in many other rooms also because Vitachrome's beautiful bright colors have a high degree of light reflectivity.

For an industrial flooring in attractive colors... use Tuff-Tex Greaseproof Industrial Tile.

It's "tough all the way through," yet is quiet, comfortable and safe under foot. This heavy-duty flooring takes rolling friction, greases and oils. Excellent for storage areas, boiler rooms, machine areas, laboratories, etc.

For a low price, long-wearing resilient floor... use Tile-Tex Asphalt Tile.

Tile-Tex is the pioneer asphalt tile. During the past thirty years, this handsome tile has become recognized as a standard of quality. You can find just the shade you need in this broad selection of tile-deep colors.

See your Tile-Tex Contractor for complete information. He is listed in the classified pages of your telephone directory under the Tile-Tex Trademark. Or write:

TILE-TEX, a division of THE FLINTKOTE COMPANY, 1234 McKinley Avenue, Chicago Heights, Illinois

TILE-TEX – PIONEER DIVISION, The Flintkote Company, P. O. Box 2218, Terminal Annex, Los Angeles 54, California.

The Flintkote Company of Canada, Ltd., 30th Street, Long Branch, Toronto, Canada

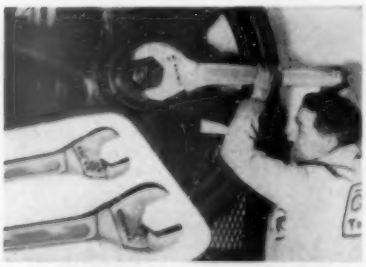
TILE-TEX... *Floors of Lasting Beauty*

Manufacturers of Flexachrome*... Tile-Tex*... Tuff-Tex*... Vitachrome*... Holiday†... Mura-Tex* ... and Modnar†, the latest development in asphalt tile.

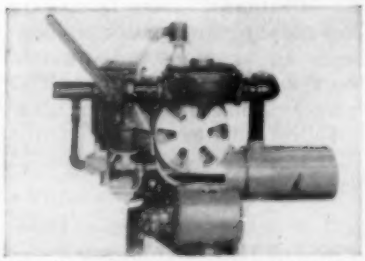
*Reg. U. S. Pat. Off. †Trademark of The Flintkote Company

For more about these products, circle item numbers on Reader Service card next to back cover.

54—Stud Driver has interchangeable barrels for "power loads" that deliver impacts of varying force. Each load designed for proper penetration in wood, metal, steel, concrete, when used with steel studs of specific diameters, lengths, purposes. *Remington Arms Co.*



55 — Adjustable Wrenches, two giants, replace 42 fixed sizes. Non-slip jaw settings in ⅛- and 1/16- in. graduations handle adjustment range from 1⅜ to 4¾ in. ‡24-in. "Slim Twin" withstands 3500 ft. lb. of torque; 36-in., 10,000 ft. lb. *Owatonna Tool Co.*



56—Gas Burners are priced 30-40% lower than previous models. Includes six gas/oil burners with 720,000 to 8,600,000 Btu. capacities. For gas alone, light oil and gas, heavy oil and gas. Secondary air furnished by burners. *Cleaver-Brooks Co.*

Pangborn answers the

"Call from Philip Morris"

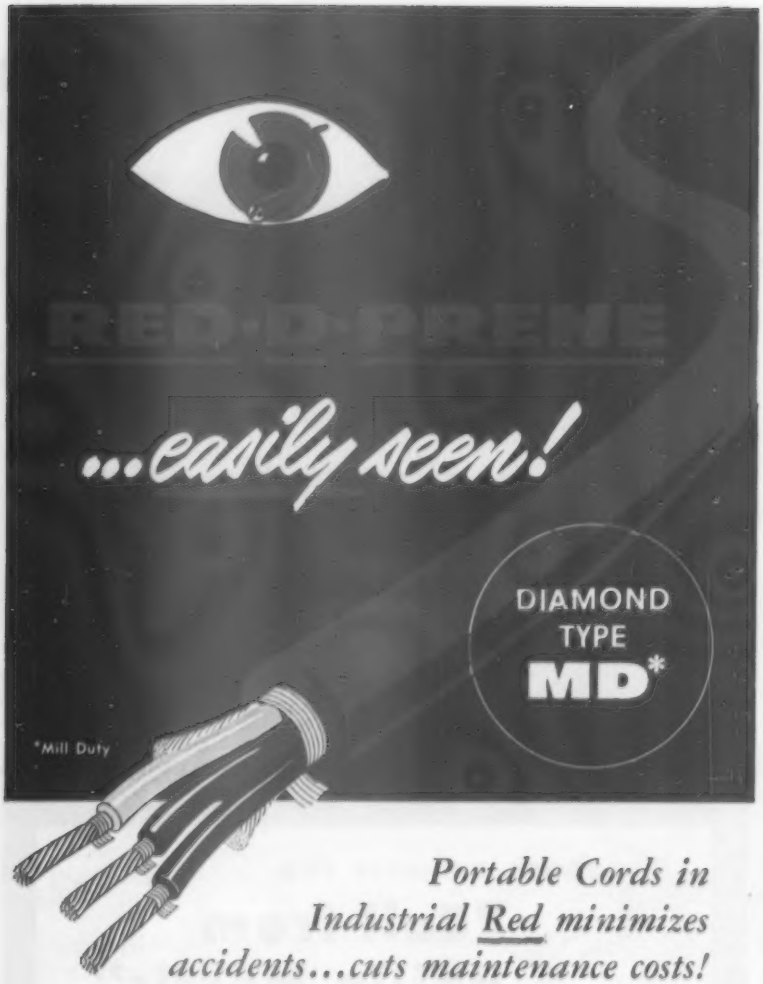
Collects 5,000 lbs. of tobacco particles daily to be sold for salvage.

At the stemmery plant of Philip Morris and Co., Ltd., Richmond, Va., the tobacco used in Philip Morris products is processed prior to manufacture into cigarettes. To keep the working area immaculate and maintain the excellent operating conditions, Philip Morris calls upon four Pangborn Dust Collectors for efficient removal of any minute tobacco particles released in this processing. Every day, Pangborn Dust Control collects 5,000 lbs. of particles which are sold as fertilizer ingredient. In addition, Pangborn minimizes plant housekeeping problems.

Pangborn can solve *your* dust problem. Pangborn engineers will be glad to show you how Pangborn Dry or Wet Dust Collectors can save you time, trouble and money.

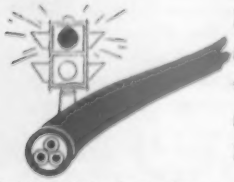
See how Pangborn benefits varied industries. Write for free copy of "Out of the Realm of Dust." Pangborn Corp., 2100 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn
CONTROLS DUST



Portable Cords in Industrial Red minimizes accidents...cuts maintenance costs!

No flat sides, no off center conditions. Gives maximum flexibility, is moisture resistant.



Industrial Red sheath provides maximum visibility for absolute identification.

For positive identification — in your stockroom or inside and outside the plant by maintenance men—Type MD RED-D-PRENE is your safe choice! First designed with a tough, oil-resistant Neoprene sheath (in Industrial Red). Assures long wear, materially reduces maintenance costs. Carries current where you want it, safely and at lower cost. Outstanding for heavy duty use in Mill and Plant installations.

Without delay : : : write for our new descriptive brochure and samples!

Trade Mark

DIAMOND WIRE & CABLE CO.

SYCAMORE, ILLINOIS

FACTORY / EQUIPMENT NEWS

Begins on page 160

For more about these products circle item numbers on Reader Service card next to back cover.

57—Arc Welders, engine-driven a-c, are for field production and maintenance jobs that need light, rugged, dependable units. Models GEA200 and GEA200L are suitable for pipe heating jobs—ice thawing; evacuating heavy viscous fluids. *Air Reduction Sales Co.*

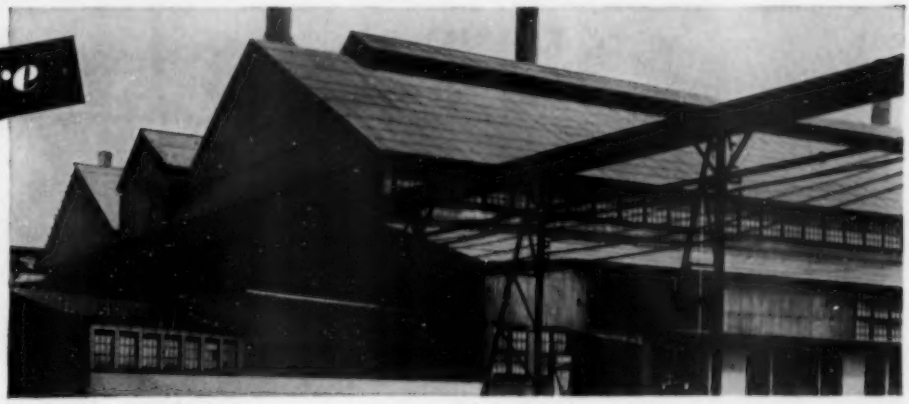
58—Controlled Volume Pump solves low-capacity flow-control problems. Uses air servo system with feedback loop for adjustment with accuracy within 1%. Stroke length infinitely adjustable from zero to 100% of full length. Cabinet 22-in. high. *Milton Roy Co.*

59—Felt Machinery Mounts are adhesive-coated on both sides, permitting quick installation or relocation of equipment without bolts. Noise- and vibration-reducing felt will not deteriorate; resists oil, grease, acids. Several thicknesses, sizes. *Western Felt Works.*

Turn the page

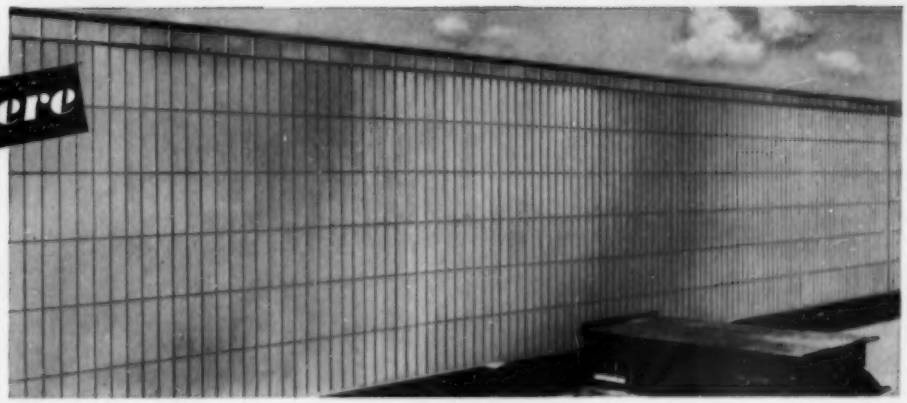
No costly maintenance problem

. . . here



On this steel plant, roofs and sidewalls of Johns-Manville Corrugated Transite withstand corrosive fumes . . . will never corrode or rot.

. . . or here



On this aircraft plant, stonelike Corrugated Transite sidewalls offer years of service without paint or special treatment to preserve them.

build with Johns-Manville Corrugated Asbestos Transite

For maintenance-free roofs and sidewalls plus protection from fire, rot and weather

YOU SAVE MONEY on construction and maintenance when you build with Johns-Manville Corrugated Transite®. Corrugated Transite comes in large sheets that require a minimum of framing . . . permits fast economical construction of industrial, commercial, institutional and agricultural buildings.

Made of asbestos and cement, Corrugated Transite is practically indestructible. It never needs paint or special treatment to preserve it . . . it's fireproof, rotproof and weatherproof. Corrugated Transite is also used increasingly for interiors. The streamlined corrugations and attractive shadow lines offer interesting design possibilities.

Investigate Johns-Manville Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure. Write Johns-Manville, Box 158, Department FM, New York 16, New York. In Canada write 565 Lakeshore Road East, Port Credit, Ontario.

- Large sheets go up quickly
- Easy to fasten to steel
- Easy to nail to wood
- Easy to saw
- Easy to drill

See "MEET THE PRESS" on NBC-TV, sponsored on alternate Sundays by Johns-Manville

JOHNS MANVILLE JM PRODUCTS **Johns-Manville**

NEW concept gives you

Fast, dust-free floor cleaning

FLOORMOBILE . . .

Suction cleans floors faster than sweeping!

Keeps dust out of the air!

Promotes safety!

Prevents dust damage!

Saves up to $28,500 annually!

gas engine powered

Floormobile is a powerful, highly mobile floor cleaning machine that *sucks up dust*, as well as dirt, lint, string, cloth, paper, and other trash. You get *dust-free and faster* floor cleaning with Floormobile. It suction cleans up to 20,000 square feet an hour (compared to 3,000 square feet an hour for broom sweeping).

Brooms and mechanical sweepers can't eliminate dust . . . they just stir it up . . . and the cost of this unnecessary dust condition is staggering. It means extra cleaning work, damage to precision equipment, motors, fixtures, work in process, stored merchandise . . . and it also causes sickness and absenteeism. Floormobile has been proved the only practical way to remove *both* dust and dirt from large floor areas. Over 250 nationally known companies now have one or more Floormobiles in daily use.

New Bulletin #551 gives complete details on Floormobile, including a comparison with other floor cleaning methods. Take a minute and send for your copy today . . . *it could mean big savings and a cleaner plant.*

Handling Devices Company, Inc.

Handling Devices Company, Inc.
Dept. F, 43 Pearl St., Brookline 47, Mass.

Please send me new Floormobile Bulletin #551, without obligation.

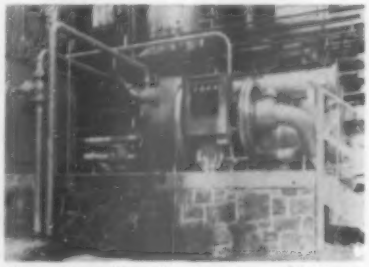
Name.....Position.....

Company.....

Address.....

City.....Zone.....State.....

For more about these products, circle item numbers on Reader Service card next to back cover.



60—Centrifugal Water Chillers, CenTraVac line, for outdoor installation without protective enclosure. Hermetic construction and automatic operation, plus weatherproofing features, make them suitable for outdoor use. Save valuable floor space. *Trane Co.*

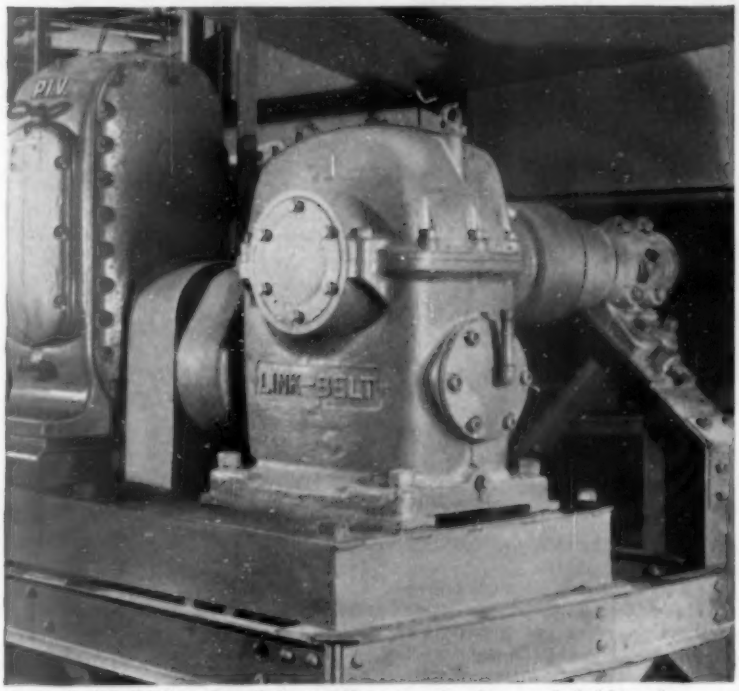
61—Valve Lubricant Gun is self-priming. Compact, light-weight, air-operated unit meets field and maintenance needs. "Hypregun" weighs only 39 lb.; pressures to 150 psi. 5-qt. cans load directly into gun, eliminating manual handling. *Rockwell Mfg. Co.*

62—Roof Deck has UL approval of one-hour fire rating. Made of corrugated steel, layer of concrete mixed with volcanic rock aggregate, topped with asphalt. Deck was tested with under side of corrugated metal exposed directly to flames. *Perlite Institute.*

Turn the page

Here's real versatility! LINK-BELT offers you

19 VARIATIONS in WORM GEAR DRIVES



Link-Belt Worm Gear Drive provides compact and economical right-angle power transmission to apron conveyor. Conveyor speed is readily changed by P.I.V. Variable Speed Drive to suit operating conditions.

Meet specific needs from industry's most comprehensive line

WHATEVER the need . . . whatever the speed — Link-Belt Worm Gear Drives can meet your requirements for simple, compact, fixed-ratio speed reduction. With them, you can change the direction and velocity of power . . . match high motor speeds to modern production needs with the least power loss, best possible balance of torque and horsepower ratings.

Choose from a wide selection for fractional or large horsepower requirements. Available with horizontal and vertical housings to permit convenient connections to prime movers and driven machinery.

Single-Worm Gear Drives in ratios from 3.1:1 to 100:1 with output capacities to 97.9 hp.

Helical-Worm Gear Drives in ratios from 26:1 to 540:1 — output capacities to 56.7 hp.

Double-Worm Gear Drives in ratios from 26:1 to 8000:1 — output capacities up to 26 hp and 124,000 inch-pounds torque.

8 of 19 types in the broad Link-Belt line

Type WB—Single reduction, worm below gear, horizontal output shaft.

Type HWV—Helical gear first reduction, worm gear final reduction. Vertical output shaft (up or down).

Type WVS—Single reduction, worm on top of gear, horizontal shaft with screw conveyor flange.

Type HWB—Helical gear first reduction, worm gear final reduction. Worm below gear, horizontal output shaft.

Type DWV—Double worm reduction gear, vertical output shaft (up or down).

Type WV—Single reduction, vertical output shaft (up or down).

Type DWB—Double worm reduction gear, horizontal output shaft.

Type WVT—Single or double reduction overhead conveyor drive.

For full information, consult your local Link-Belt office or authorized stock-carrying distributor. Or write today for Book 2324-A.

LINK-BELT

ENCLOSED DRIVES

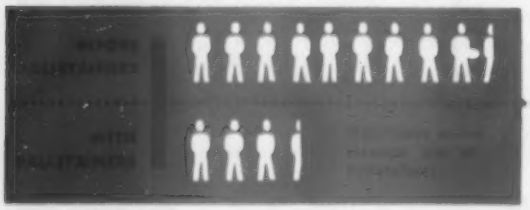
LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,505

USP Warehouse type Palletainer features half-drop end gate for easy access. 2,000 or 4,000 lb. capacities.

USP Palletainers are available in a wide range of sizes, types, styles and loading capacities from 500, 1250, 2000, 4000 and 6000 pounds per unit. There's a Palletainer to meet every need.

The versatile USP Palletainer, specifically designed for warehouse operation, is rapidly revolutionizing industrial methods for the handling and storage of service parts. Its special features make it readily adaptable to many other uses throughout the plant. The special hinged-end access door allows fast, easy removal or replacement of contents. This feature, plus the exclusive USP steel stacking leg permits stacking in positions that afford greater space savings, require less aisle space and permit free access to men and lift trucks. Add to these features the advantages of visual inventory, increased storage capacity and fold-flat shipping and storage and you can see where USP Warehouse Palletainers save time, labor and money.

Get all the facts on Palletainers today—write for full information, specifications and costs. USP materials handling engineers are at your service—without obligation.



USP

UNION STEEL PRODUCTS CO. ALBION, MICHIGAN

Please send me complete information on Palletainer application.

Name and Title _____

Firm and Name _____

Address _____

City, Zone and State _____

FACTORY / EQUIPMENT NEWS
Begins on page 160

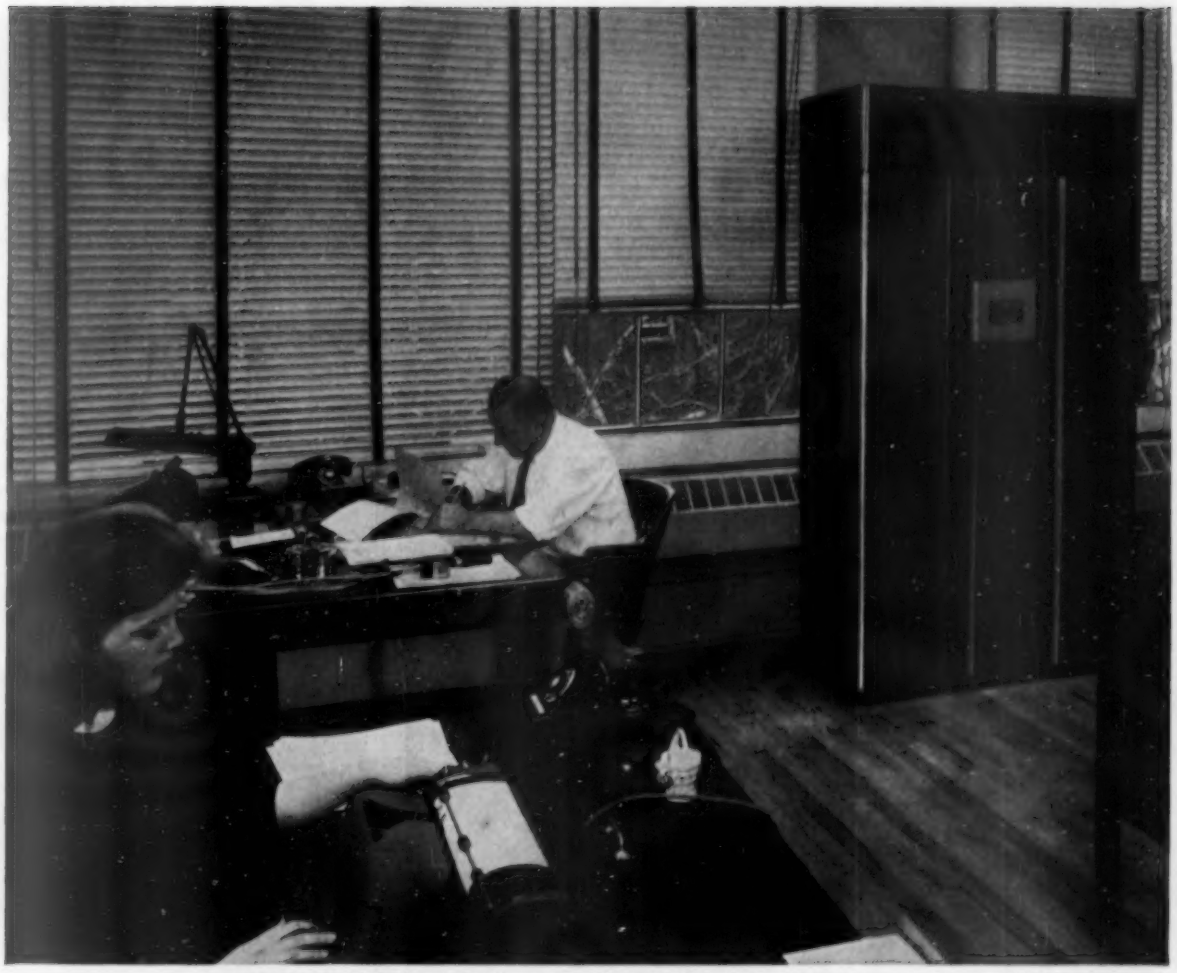
For more about these products circle item numbers on Reader Service card next to back cover.

63—Fire Truck is specially designed for combating plant fires. "Fire Ball Special" has 500 gpm. pumper. Equipped with foam for fighting oil fires, or CO_2 and dry chemical (nitrogen-forced) for chemical fires. 183-hp. engine. *Ward LaFrance Truck Corp.*

64—Fluid Transfer introduces fluids under pressure from stationary source to rotating equipment. On deep or precision hole drilling, transfers coolant to drill point for chip removal, cooling cutting edge. Transfers fluids to cylinders, clutches. *Sealol Corp.*

65—Flame-Cutting Machine features permanent magnetic roller that follows metal template of most intricate shape. No. 42 "Camograph" cuts any shape to full 42-in. circle, straight lines to 92 in. Ideal production tool, auxiliary unit. *Air Reduction Sales Co.*

Turn the page



IT'S COOL WORKING for plant office personnel at The Okonite Company factory in Passaic, N.J. Good-looking, quiet-running Worthington air conditioners make sure of that — on even the hottest days. Wintertime? Okonite gets another benefit by using their Worthington units to deliver warm air.

Worthington air conditioners boost office efficiency at Okonite plant

No more sweltering work-days for factory office personnel at The Okonite Company.

This leading manufacturer of electrical wire and cable beats the heat with three Worthington packaged air conditioners, strategically located throughout office work areas.

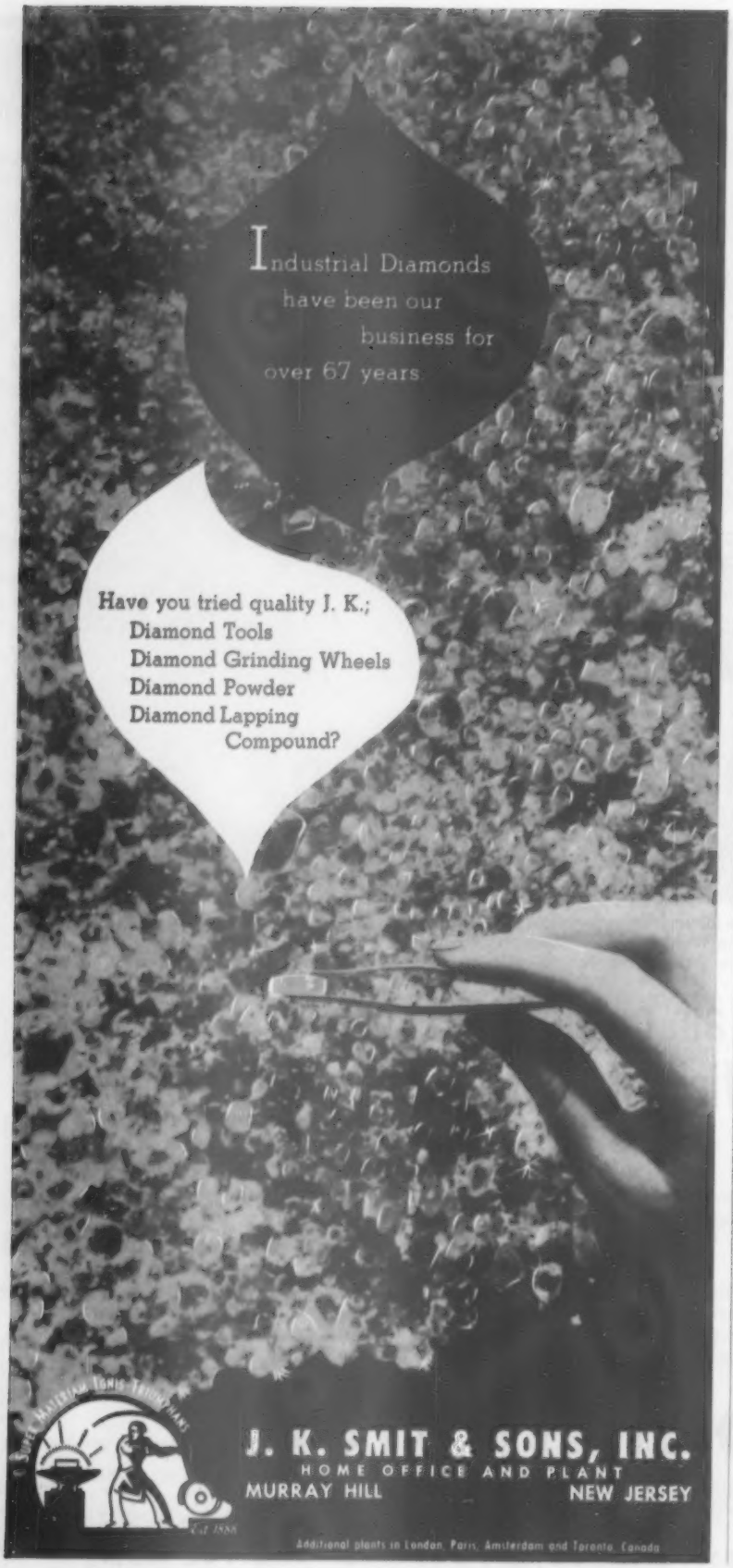
Installed as part of a general plant modernization program, the Worthington units have paid off for Okonite. Fact is, these air conditioners are actually set up to do double duty as heating units during the winter. Management is convinced that improved working conditions through year-round office air conditioning result in higher efficiency, less absenteeism.

How's the climate in your office area? If you've got any doubts about it, call your nearest Worthington dealer. He's ready to answer any air conditioning need — whether it's packaged units for "spot" cooling or giant central station systems for entire buildings. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Sect. A.5.40FN, Harrison, N.J.

A.5.40-FN

WORTHINGTON

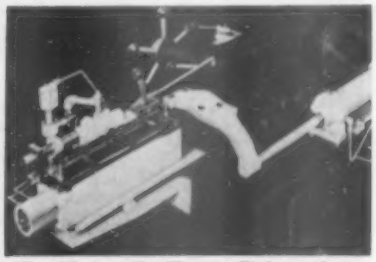
CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME



FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.

66—Tractor Loader is ideal for indoors and out. Bucket operates flush against walls and into corners; turning radius is only 11 ft. Capacity of the Model TL-10 Tracto-Loader is full cubic yard, with 25 deg. of tip-back at ground level. *Tractomotive Corp.*



67—Hydraulic Turret Drive adapts to standard ram-type turret lathes: Nos. 1, 2, 3, 4, 5. Eliminates hand-indexing and traversing; operator is free to inspect and prepare next piece for chucking. Reduces rejects, tool breakage; improves finishes. *A. W. Cash Co.*

68—Expendable Paper Pallet supports 2000 lb., but weighs only 4 lb. Delivered "knocked down"; occupies 25% of space required by ordinary pallets. Easily assembled in about 30 seconds. Two-way entry for truck forks. Fire-, moisture-proof. *Titan Products Co.*

Turn the page

POWELL *flow-matic** Slashes Handling Costs for Leading Automotive Parts Manufacturer

Executives of the Eaton Manufacturing Company's Saginaw, Mich., plant became concerned over the costs of handling materials during manufacture. They decided a thorough study of modern equipment currently available was in order. Their decision: Flow-matic* by Powell—a highly flexible system of automatic feed hoppers and boxes that enables users the greatest cost reductions on a plant-wide variety of operations.

BEFORE

Parts were handled in small quantities in tote pans. This meant the machine operator was constantly lifting and carrying. Weights had to be kept light to prevent injury to the operator. The pans were then stacked on pallets requiring lift truck handling. Warehousing and inventory were slow, tedious jobs.

AFTER

Same lift trucks were utilized. Instead of the dozens of small pans, each individual operation was consolidated with but a single hopper stand. The hopper put the work right at the machine—no lifting or carrying. Production benefited. Floor area became neater, more efficient. Warehouse area was reduced considerably.

Remember handling adds nothing to the value of your product. Unnecessary handling increases your costs, weakens your competitive position. Make sure you have the most efficient handling possible. If you honestly compare—we're sure you, too, will specify Flow-matic* for your handling reuirements.

***TM Powell Pressed Steel Co.**

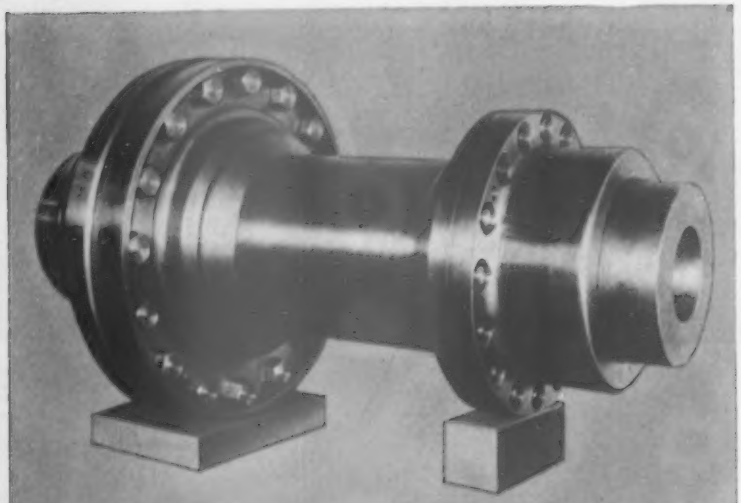
When lift truck operator sets Flow-Matic* box on stand it automatically opens, discharging contents into "right-level" work hopper. The system is easily adaptable to a wide variety of jobs.

THE POWELL PRESSED STEEL CO.

DEPT. 1115 HUBBARD, OHIO

1800 lbs.

...is the weight of this SPECIAL forged steel insulated spacer WALDRON GEAR COUPLING



Despite its size and weight, it is in perfect dynamic balance.

The compressor or driven end is a size 8 gear half with the hub taper bored. The main motor, or drive end, is a size 6 gear half with the hub straight bored. The forged steel spacer is 24" long.

The coupling will connect a 14,000 H.P. synchronous motor to an axial compressor. 18,000 maximum H. P. will be transmitted at 3,600 R. P. M.

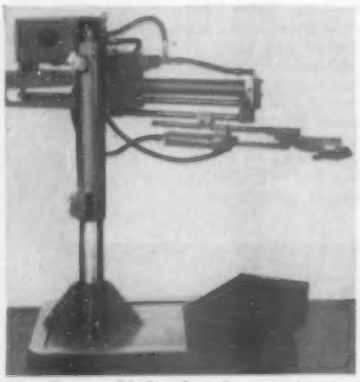
This special insulated coupling is only one of many special units which we design and make.

We invite your inquiries regarding couplings to successfully solve your particular problem. No obligation.

JOHN WALDRON CORPORATION
New Brunswick, N. J.
Since 1827

Sales Representatives In Principal Cities

For more about these products circle item numbers on Reader Service card next to back cover.



69—Press Unloader has swiveling base for side or back unloading; is portable, adjustable. Jaw travel is in straight line, permitting removal of small parts at high speeds. For back-geared presses, where overhead unloaders are prohibited. *Sahlin Engineering Co.*

70—Impact-Proof Clamp for transit cases, shipping, and storage containers has passed severe drop and tumbling tests — springs are never over-stressed. Doesn't require precise mounting. Operates even when icy. Recessed, embossed, ribbed installation. *Bassick Co.*

71—Prefabricated Soundproof Room is shipped in sections; can be assembled by two men in less than four hours. Suitable for shop office, telephone room, audiometric testing, etc. Well lighted, ventilated; comes with a carpet, adjustable table. *Kittell-Lacy, Inc.*

Turn the page

THE POWELL PRESSED STEEL CO.
DEPT. 1115 HUBBARD, OHIO

See what adhesives are doing today!

Sealing a spot-welded "sandwich"

3M ADHESIVES

If any operation in your plant requires a welded seam to be weather- and water-tight, take another look at the picture above. The filling you see in that all-steel "sandwich" is a unique 3M product called EC-1168—a weld-through sealer.

Under the high flash "fire" of the spot-welding operation, EC-1168 shows not a trace of splatter or burning. It squeezes away from the immediate weld area, yet fills in tightly all around the weld to maintain a permanent, *flexible* seal. With EC-1168, you can seal far more effectively because you utilize the full width of the seam, rather than the usual slender bead at the lap edge.

See what adhesives can do for you...

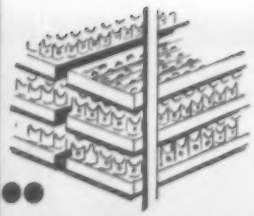
Automobile and truck manufacturers—heating and air-conditioning companies, too—have found EC-1168 to be one of many 3M products valuable to them in doing a better job. If *you* have a design or production problem, let 3M put its research and resources into solving it. Call in your nearest 3M Field Engineer. Or write 3M, Dept. 311, 417 Piquette, Detroit 2, Mich.

ADHESIVES AND COATINGS DIVISION **MINNESOTA MINING AND MANUFACTURING COMPANY**

417 PIQUETTE AVE., DETROIT 2, MICH. • GENERAL SALES OFFICES: ST. PAUL 6, MINN. • EXPORT: 99 PARK AVE., N. Y. 16, N. Y. • CANADA: P.O. BOX 757, LONDON, ONT.

MAKERS OF "SCOTCH" BRAND PRESSURE-SENSITIVE ADHESIVE TAPES • "SCOTCH" BRAND SOUND-RECORDING TAPE • "SCOTCHLITE" BRAND REFLECTIVE SHEETINGS • "3M" ABRASIVE PAPER AND CLOTH • "3M" ADHESIVES AND COATINGS • "3M" ROOFING GRANULES • "3M" CHEMICALS

EASY IN-
EASY *OUT*...



WHEEL CONVEYOR STORAGE RACK

Upper view shows automobile pistons being fed into Logan Wheel Conveyor Storage Rack from trolley conveyor. Pistons are placed into appropriate storage lanes according to size. On discharge side, in lower view, pistons are selected by size as required and delivered to engine assembly line. Confusion and delays are eliminated.

Easy loading at the load end, easy removal at the discharge end . . . and when a part is removed — another rolls into place. That is the principle of Logan Wheel Conveyor Storage Racks: Advantages:
(a) Eliminate confusion and hazards which frequently accompany use of skids and trucks. (b) Save aisle space required for trucking. (c) Stock always ready on first-in-first-out basis. (d) Material flows by gravity. (e) Quick visual check of stock at all times. (f) Save steps, time, money. Adaptable to hundreds of different products in many industries. Perhaps there is an application in your plant. Write for further information, or for nearest Logan engineer.

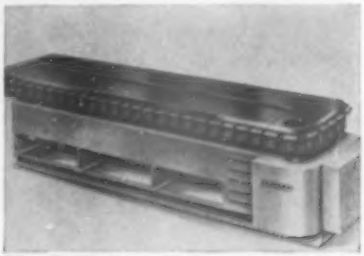
LOGAN CO., 510 CABEL ST., LOUISVILLE, KY.

Logan Conveyors

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.

72—Stool is strong and rigid; price is low. Quality feature: die-formed legs are arc-welded at two points to 16-in. foot rings and stretchers. "Ajax" stool is available in seven fixed heights, 18-30 in. Adjustable back rest is optional. *Ajusto Equipment Co.*



73—Indexing Unit, straight-line, transfer type, is basic chassis for automatic and semi-automatic assembly. Takes devices for drilling, tapping, staking, etc.; hopper feeds. "Auto-Tran" has 48-72 carriers; 3-, 6-, 9-, 12-in. travel. *Swanson Tool & Machine Products.*

74—Outlet Cutter makes clean holes for electrical outlets in gypsum wallboard. In tests Model No. 272 cut over 1000 holes in 8 hours. Handles thicknesses of ⅜, ½, and ⅝ in. Winged pilot hole cutter eliminates need for brace and bit. Attachments. *Stanley Works.*

Turn the page

You get modern, on-the-job efficiency from fluorescent installations equipped with

CERTIFIED CBM BALLASTS

Everyone—the architect, fluorescent fixture manufacturer, distributor, electrical contractor and the ultimate user—wants fluorescent lighting installations to give satisfactory performance.

The easiest way to be certain of getting top efficiency is to insist that all fluorescent fixtures are equipped with CERTIFIED CBM BALLASTS.

Manufacturers of fluorescent tubes, who know how important ballasts are to the proper operation of their lamps, recommend and endorse the use of CERTIFIED CBM BALLASTS.

CERTIFIED CBM BALLASTS assure:

RATED LAMP LIFE • FULL LIGHT OUTPUT • LONG BALLAST LIFE • QUIET, TROUBLE-FREE OPERATION

Eight of the country's leading manufacturers of ballasts make CERTIFIED CBM BALLASTS. Participation in CBM is open to any Manufacturer who wishes to qualify.

Send for free new booklet, "Why It Pays to Use CERTIFIED CBM BALLASTS in Fluorescent Lighting Fixtures".

CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

For more about these products, circle item numbers on Reader Service card next to back cover.

75—Pipeline Desurger reduces excessive pulsations and pressure surges in liquid-carrying lines. Size is 1/6 of older devices, but twice as effective. In tests, removed 92% fluctuation in slush pump discharging at 800 psi. Maximum, 2000 psi. *Westinghouse Air Brake Co.*

76—Leveling Mount permits quick and easy mounting of machinery of all kinds without lagging to floor. Reduces noise, shock, vibration. Machine will not walk or creep. Load ranges 1000-12,000 lb. per mount. 6 models, 3 sizes, 2 types of "Isomode" pads. *MB Mfg. Co.*

77—Drum Dumper fits any fork truck, rider or walker. "Dumpit" handles any container 32- to 36-in. tall with a top and bottom chime or lip: drums, barrels, boxes, etc. Special attachments for plain bottom containers, scooping, and other purposes. *Basic Methods, Inc.*

Turn the page

Save thousands of dollars in shipping costs!

This free booklet tells how

Here's a big, 24-page, illustrated booklet packed with basic facts on shipping containers — and shipping problems — that has shown others how to save thousands and may do the same for you.

It tells you about Atlas Plywood's free service that enables you to find out: (1) whether you can get a *safer* shipping container; (2) whether you actually *can* cut your present shipping costs; and (3) just *how much* you can save.

It tells you how Atlas Plywood containers are made, how they're engineered to meet your shipping requirements — and how they earn their lab-tested label in our modern laboratory, equipped with the latest container testing devices.

What about your own present shipping containers? Are they:

— causing damage claims, due to inadequate product protection?

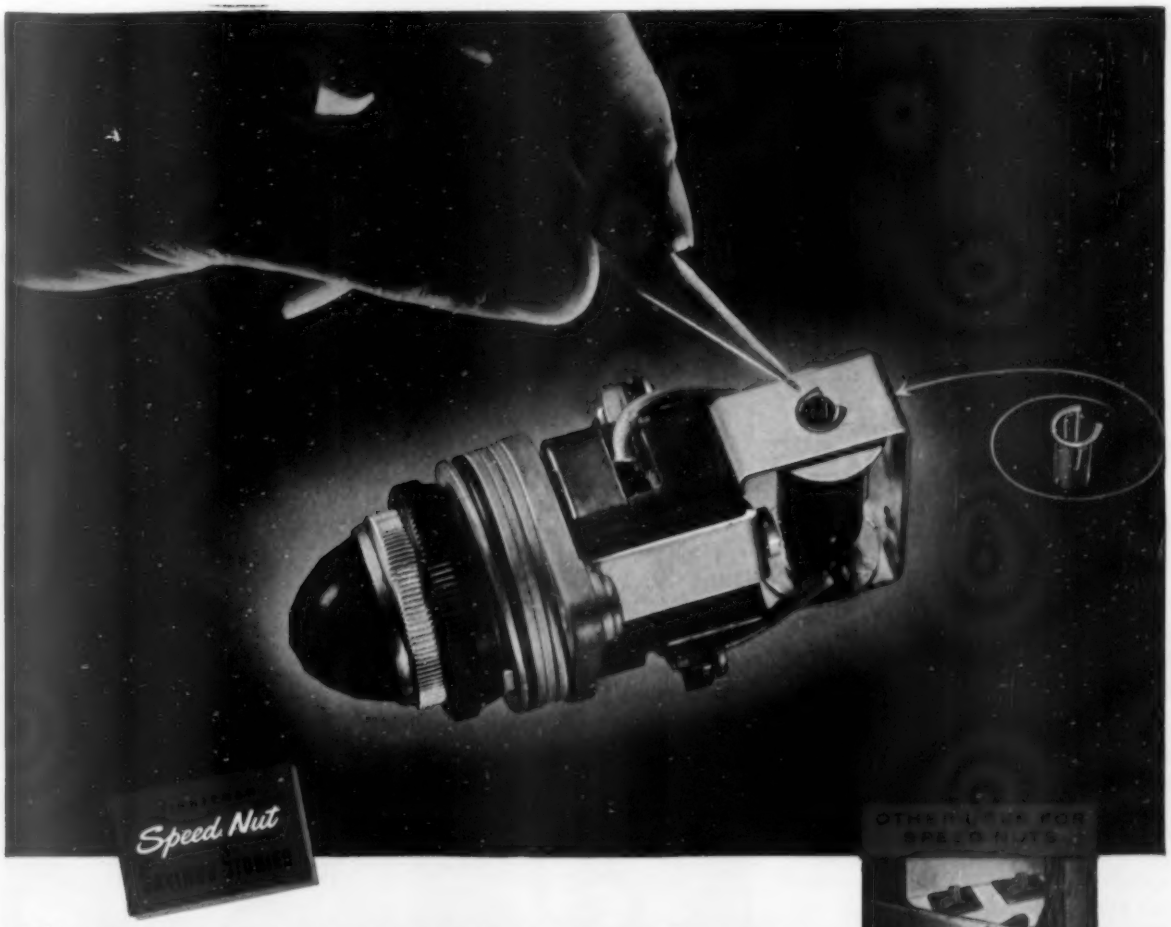
— boosting your freight costs because they weigh too much?

— costing you extra man-hours to assemble?

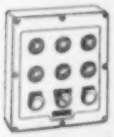
The thing to remember about these money-wasting handicaps is: *each one of them is preventable.*

This booklet tells you how — and the sooner you get this information, the sooner you can profit by it. Ask your Atlas Plywood representative (listed in your classified phone directory) for your free copy of "How Atlas Plywood Cuts Your Shipping Costs . . . Safely." Or write to Atlas Plywood Corporation, Dept. FM-11, 1432 Statler Building, Boston 16, Mass.

Atlas Plywood
CORPORATION
BOSTON 16, MASS. • DISTRIBUTORS IN ALL PRINCIPAL CITIES
PLYWOOD CONTAINERS • FLUSH DOORS • HARDWOOD PANELS
FROM AMERICAN FOREST TO FINISHED PRODUCT



Time-saver, space-saver, money-saver ...Tinnerman tubular SPEED CLIP®!



Here's how the General Electric Company is keeping costs and space requirements low on its G-E oiltight Indicating Lights. They use Tinnerman tubular-type SPEED CLIPS to assemble the resistor to its support. This one-piece, spring-steel fastener reduces assembly time, material costs, parts handling and inventory by eliminating a long bolt, centering washer, lock washer and nut. It also reduces the dimension across the resistor support and saves valuable space when the lights are used close to pushbuttons and other components.

A wide variety of types and sizes of tubular-type SPEED CLIPS are used on everything from toys to autos—on metal, plastic or wood. They snap into punched or molded holes by hand; are self-retained in stud-receiving position. SPEED CLIPS are also ideal for blind attachments where only one side of an assembly is accessible.

Possibly Tinnerman SPEED NUT brand fasteners can help you improve your present fastening methods. See your Tinnerman representative soon and write for your copy of "SPEED NUT Savings Stories".

TINNERMAN PRODUCTS, INC. • BOX 6688, DEPT. 12, CLEVELAND 1, OHIO

Canada: Dominion Fasteners, Limited, Hamilton, Ontario. *Great Britain:* Simmonds Aerocessories, Limited, Treforest, Wales. *France:* Aerocessoires Simmonds, S. A., 7 rue Henri Barbusse, Levallois (Seine). *Germany:* Hans Sickinger GmbH "MECANO", Lemgo-i-Lippe.

TINNERMAN Speed Nuts®
FASTEST THING IN FASTENINGS®

Tubular SPEED CLIPS save 51% in time, 34% in cost, assembling Drive-In auto speakers.

Push-On SPEED NUTS save 50% in assembly of rotating TV-antenna control box.

"J" and "U" type SPEED NUTS help gain 50% assembly saving on jet-convector heater.

Where can you get a sling like this?

7½ ton flywheel being lifted by two ⅝" JalKlamp Choker Slings.

More strength at lower cost— with JalKlamp

Here's the newest way to cut your materials handling costs.

J&L can furnish safer, stronger wire rope slings and terminals *at lower cost* thanks to JalKlamp, the new sleeve for wire rope splicing, exclusive with J&L.

The reason: non-corrosive JalKlamps are made from a special alloy. When hydraulically pressed around the rope, this alloy flows into the spaces between the wires and strands . . . produces a neat, permanent, watertight splice that's stronger than any tucked splice. And, because they're machine made, JalKlamp splices cost less.

JalKlamp slings and terminals are available for all standard wire rope constructions and in diameters ranging from ⅛" through 2", with SpringKore, Plasti-Kore, Fiber Core, and Independent Wire Rope Centers.

Specify JalKlamp slings and terminals and get these features:

1. High Strength
2. Economy
3. Non-Corrosive
4. Water Tight
5. Permanent
6. Neat, Safe — no jagged ends

Jones & Laughlin Steel Corporation
407 Gateway Center,
Pittsburgh 30, Pa.

☐ Please send me a free copy of your JalKlamp booklet.

Name_____

Company_____

Address_____

_____

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

FACTORY / EQUIPMENT NEWS
Begins on page 160

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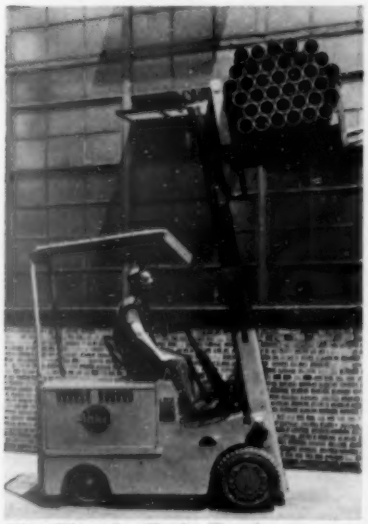

78—Electric Fork Trucks, a new line, are designed for high maneuverability, ease of maintenance, increased operator comfort and convenience. Model FT line includes trucks with 3000-, 4000-, and 6000-lb. capacities. They feature high stability. *Baker-Raulang Co.*

79—Germanium Rectifiers are available in several models, various amperes d-c output, to meet most requirements. Maintenance is minimum, as there are fewer moving parts. Fewer components and high efficiency permit small size unit. *Norma-Hoffman Bearings Corp.*

Turn the page

● A well-known varnish plant depends on this bank of Roper 3600 Series pumps to keep production humming. It is a typical example of Ropers on the job, for there are many similar installations. Some pump liquids even thicker than varnish; others pump liquids as thin as gasoline. The Roper 3600 Series is available in various combinations of pump sizes, gear reduction ratios, and motor sizes to provide unusual adaptability to innumerable pumping needs in petroleum, processing, and general industries. Capacities of 40, 50, 70, 90, and 100 g.p.m. at 60 lbs. p.s.i. are available.

FEATURES THAT ASSURE DEPENDABILITY

Long service life is provided by hardened steel reduction gears running in oil on anti-friction bearings . . . a flexible coupling connects gear reduction and motor to eliminate thrust or radial loads . . . pumping gears operate in axial hydraulic balance . . . steel shafts run in high-lead bronze bearings . . . split packing gland in an extra-deep packing box facilitates servicing. You'll want *all* the facts on compact, quiet-running Ropers so send the coupon today!

ROPER
Rotary Pumps

SEE OUR CATALOG IN SWEET'S

GEO. D. ROPER CORPORATION
191 Blackhawk Park Avenue, Rockford, Illinois

☐ *Please Send Catalog 955*
☐ *Have a Roper Representative Call*

NAME_____
ADDRESS_____
CITY_____
COMPANY_____

Now! A packaged conveyor!

NEW **R-W "460"** Continuous Power Chain Conveyor **requires no special installation engineering!**

Richards-Wilcox' new "460" overhead conveyor can be installed without special engineering by your own plant personnel, quickly and easily, to meet *your* specific needs.

Completely packaged and shipped from stock, it offers economical and versatile light-load handling because of its lower load limits, flexibility, and easy installation.

R-W "460" is unequaled for jobs where the use of heavier conveyors is impractical. It is particularly recommended as a supplementary unit on production lines, and to help simplify and speed production where drying ovens, washers, paint sprayers, de-greasers and similar operations are involved.

R-W "460" is available up to 200-ft. maximum lengths *only*, with capacities of 8½ lbs. on 6-inch centers or 17 lbs. per lineal foot, and 200 lbs. draw-bar pull.

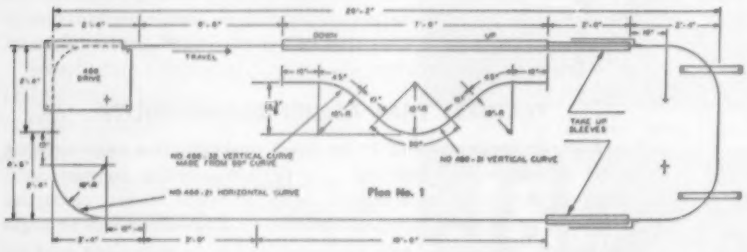

Diagram shows one of many different layouts possible with R-W "460" basic package. Up to maximum over-all length of 200 feet, variations are almost unlimited.

"460" Conveyors are shipped completely packaged, in convenient, easily-handled units, from stock throughout the U. S. Packages to fill any requirement up to 200-foot maximum length are immediately available from stock. For complete information and descriptive catalog, contact:

75 YEARS of QUALITY and SERVICE by RICHARDS-WILCOX AURORA, ILLINOIS 1857 1932

Richards-Wilcox Mfg. Co.
MATERIALS HANDLING DIVISION
Branches in Principal Cities

410 W. THIRD STREET, AURORA, ILL. SLIDING DOOR HANGERS & TRACK • FIRE DOORS & FIXTURES • GARAGE DOORS & EQUIPMENT • INDUSTRIAL CONVEYORS & CRANES • SCHOOL WARDROBES & PARTITIONS

FACTORY / EQUIPMENT NEWS

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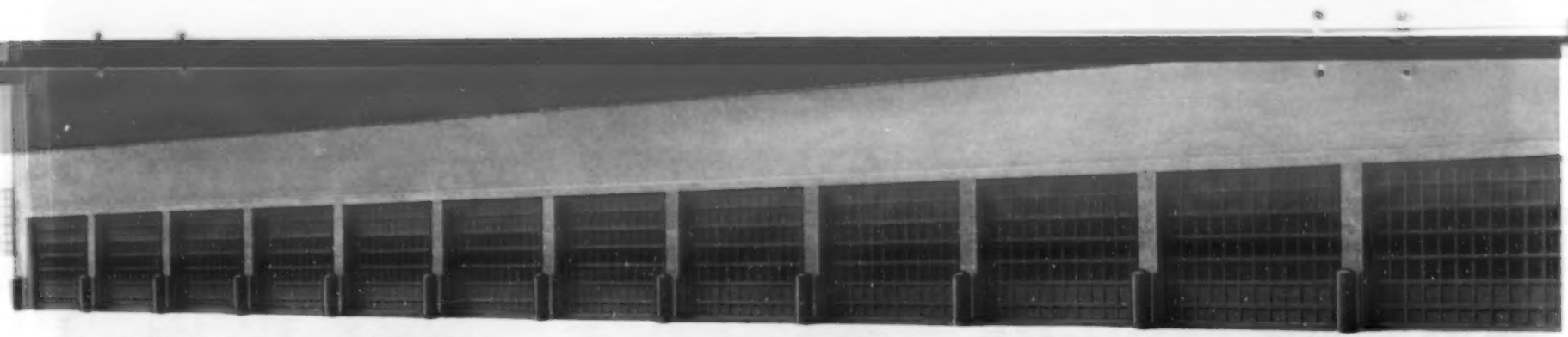
For more about these products, circle item numbers on Reader Service card next to back cover.

80—Casters have neoprene retainers, vulcanized to upper bearing raceway. Keep lubricant in, dirt and water out; reduce friction, accelerate swiveling. Easily removed for cleaning or inspection. Hard or cushion tread wheels; 5, 6, 8 in. *Faultless Caster Corp.*

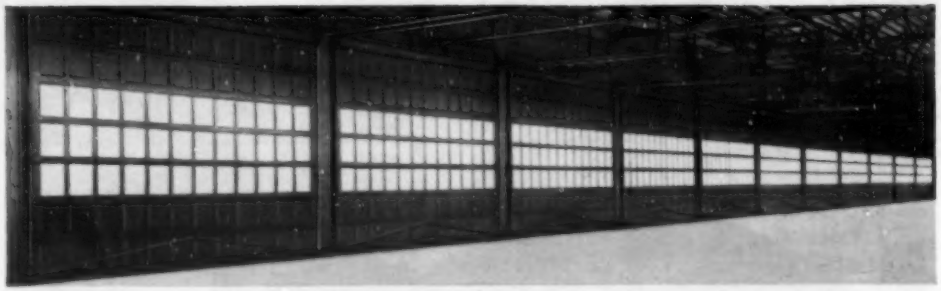
81—Moisture Separators are designed—particularly for OEM applications — where cost, quality, weight, size are major considerations. Series 125 is for compressed-air equipment, operating at 10-250 psi. Four models, for ¼- to ½-in. lines. *Wilkerson Corp.*

82—Cable Kit permits connections on the job or in the field in minutes. Seals metal connectors and electrical cables in neoprene rubber sleeves in five steps. Connection is waterproof, shockproof, tight-locking—yet instantly disconnects. No training needed. *Industriline, Inc.*

Turn the page



NATIONAL FOOD STORES MILWAUKEE DISTRIBUTION CENTER speeds heavy truck traffic with 19 Crawford Industrial Doors equipped with Electric Operators



National Tea Co. branch office and warehouse in Milwaukee is a typical modern industrial structure in which functional efficiency and good design are competently combined. The building is of steel and masonry construction and is 574 feet long, 399 feet wide and 16 feet high. It encloses approximately 230,000 square feet of floor space. As a branch warehouse for National Tea Co. which supplies all the merchandise for the National Food Stores in Wisconsin and Upper Michigan, it handles merchandise traffic up to 500 tons a day in about 100 vehicles.

To accommodate this traffic, the building is equipped with 12 — 18'0" x 14'0" and 7 — 12'0" x 14'0" Model SLA Crawford Marvel-Lift Industrial Doors, all equipped with electric operators with local and remote controls. Because of the sturdy construction of these doors and the cushioned operation achieved through the use of electric operators (always easier on doors than manual operation) these doors are in excellent condition after three years of constant use. If you have a door problem, we'll welcome your inquiry and it will get quick, intelligent attention.

Architects, write for complete file of Crawford literature including the Crawford 60-Second Door Selector, the easiest-to-use door manual ever published. Crawford Door Company, 176-20263 Hoover Road, Detroit 5, Michigan. Plants in 10 cities; Warehouses in 95 cities; Sales and Service everywhere. In Canada, F. Fentiman & Sons Ltd., Ottawa, Ontario.

National Tea Co., Milwaukee, Wis.

Architect and Engineer: **Lefebvre & Wiggins, Milwaukee**

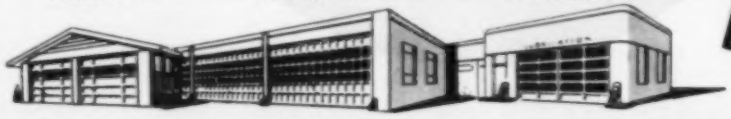
Contractors: **W. W. Oeflein Inc., Milwaukee**

Crawford Doors and operators sold and installed by
Crawford Door Sales Co. of Wisconsin

J. W. WILDE
President
Crawford Door Sales Co.
of Wisconsin

Crawford MARVEL-LIFT Doors

RESIDENTIAL — INDUSTRIAL — COMMERCIAL



INGERSOLL-RAND

MOTORPUMP

delivers PEAK LOADS when needed

The fact that you get extra value for your money is evident the day you install Ingersoll-Rand Motorpumps in your plant. Installation is easy. No special foundation or aligning is needed. Their compactness saves space, too.

Moreover, their well-balanced impellers and precision machined parts help provide peak performance and smooth operation on every job.

Efficiency is assured by the advanced design of Motorpumps which obtains maximum volume and pressure when compared with the power consumed. They're available in sizes from ¼ to 75 hp . . . 5 to 2800 gpm . . . heads to 650 feet. Get our latest Motorpump catalog and find out why these are known as the "most dependable pumps you can install, start . . . and forget!"

Ingersoll-Rand
11 Broadway, New York 4, N. Y.

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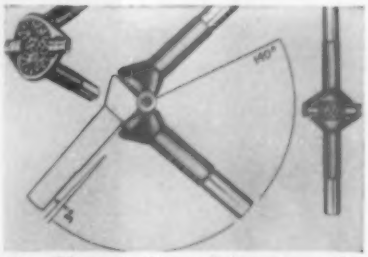
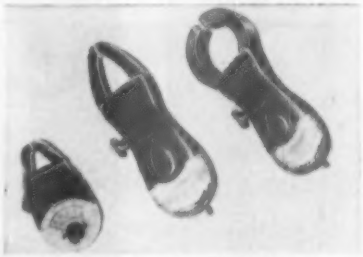


83—Hinged Gear Joint transmits power "around corners." Operates efficiently in most applications where power must be "angled" to any position 3-140 deg. away from a straight line. No need to shut or reduce speed during this wide swing. *Gray & Prior Machine Co.*



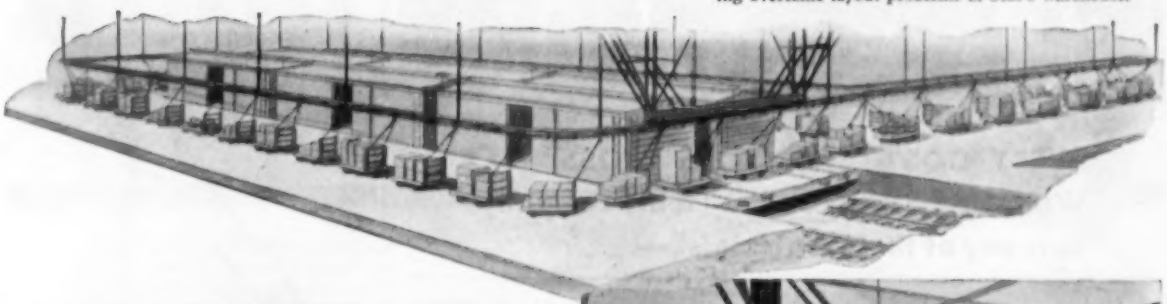
84—Snap-Around Volt-Ammeters are available in models to fit every job, every budget. "Amprobe Junior" line of economy units now includes three high-voltage models. Model 300 is for general-purpose work; Model 600 for extra heavy loads. *Pyramid Instrument Corp.*

85—Rechargeable Flashlight takes more than 200 chargings, each lasting as long as a dry cell. Charger plugs into base of light batteries, recharges overnight; handles several flashlights alternately. Cost said to pay in the end. *Gould-National Batteries, Inc.*

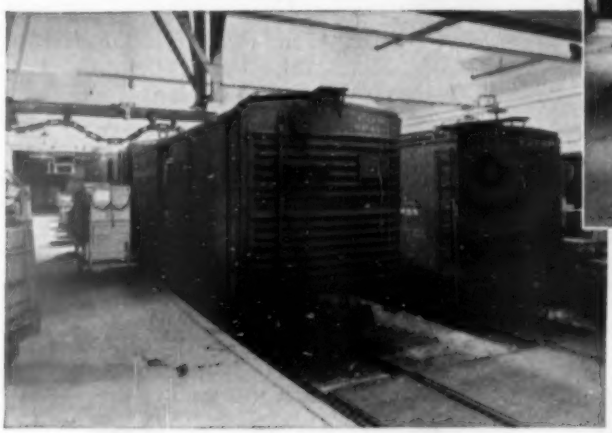
Turn the page

Link-Belt Trukveyor
SPANS RAILROAD SIDING...

Schematic drawing shows how Link-Belt engineering overcame layout problems at Sear's warehouse.



bringing fast freight handling to Sears, Roebuck



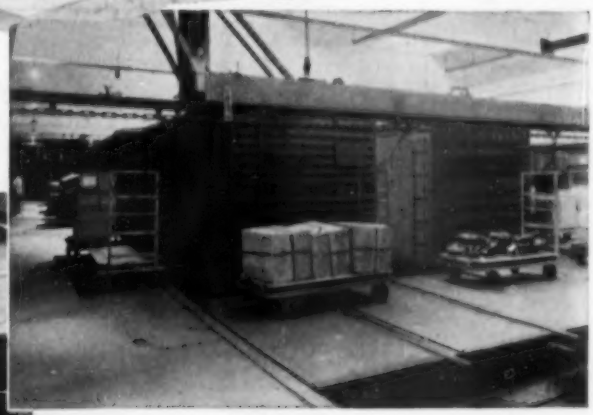


Photo above shows normal TRUKVEYOR traffic as trucks circulate along unloading platform, across bridge spanning sidings, across warehouse room to elevators, then return. To permit passage of railroad cars (left), chain is detached, trucks unhitched, conveyor bridge raised by pushbutton. Platform drops to track level. Bridge cannot be raised until chain is uncoupled.

NEW TROLLEY Integral part of overhead Trukveyor is the new Link-Belt advanced design ball bearing trolley which is engineered to insure rolling contact with the track in all positions. Available in bolted or riveted models for popular size I-beam tracks. Write for Book 2536.

When the Sears, Roebuck and Co. Boston plant was first considered for conveyorized freight handling, two railroad sidings splitting the proposed path presented an obstacle. Now freight from trucks or railroad cars is loaded on platform trucks. These are continuously towed over a regular path by a Link-Belt Trukveyor from receiving to storage.

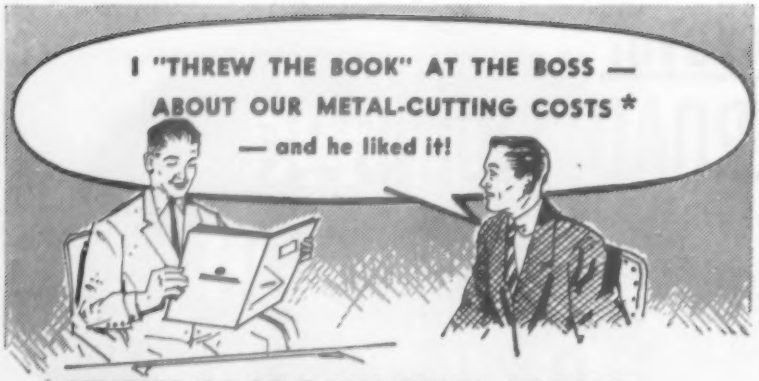
Plant, terminal or warehouse—however complex your materials handling problems might appear, call in Link-Belt. Our engineers not only can provide the efficiency you seek . . . but *chances are* within our long experience we have successfully handled requirements similar to yours. And that background is your best assurance of lower cost freight or material handling, whether by overhead or floor type conveyors.

There's a Link-Belt office near you. Call today for an analysis of your requirements. Send for Catalogs Nos. 2497 and 2330.

LINK-BELT

IN-THE-FLOOR AND OVERHEAD TRUKVEYORS
OVERHEAD TROLLEY CONVEYORS

LINK-BELT COMPANY: Executive Offices, 307 No. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,071



***EVERY COST-CONSCIOUS "BOSS" WILL LIKE THIS BOOK — if his company cuts any of these materials! —**

FREE! FOR YOUR COPY JUST MAIL THE COUPON! . . .

This unusual book — "CUTTING METAL the EASY WAY" — is not a PORTER CUTTER catalog. It's a factual study of comparative metal-cutting labor costs — prepared for those "bosses" who eliminate wasted *minutes* to save *hours* — who know that *dollars* saved daily mean *thousands* saved each year. You'll find it profitable reading.

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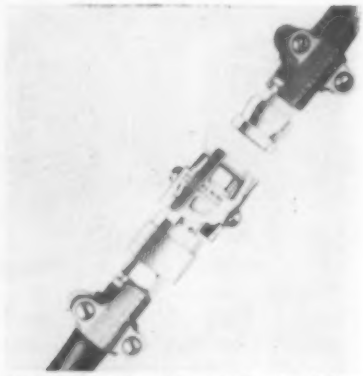
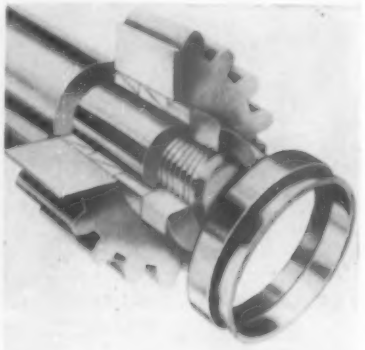


86—Valve Coupling locks in either "on" or "off and exhaust" position. Permits line air to be shut off and tools changed easily, quickly, safely at any point. Any size valve half connects to any connection half. ¼-¾ in.; to 250 psi. *C. B. Hunt & Son, Inc.*



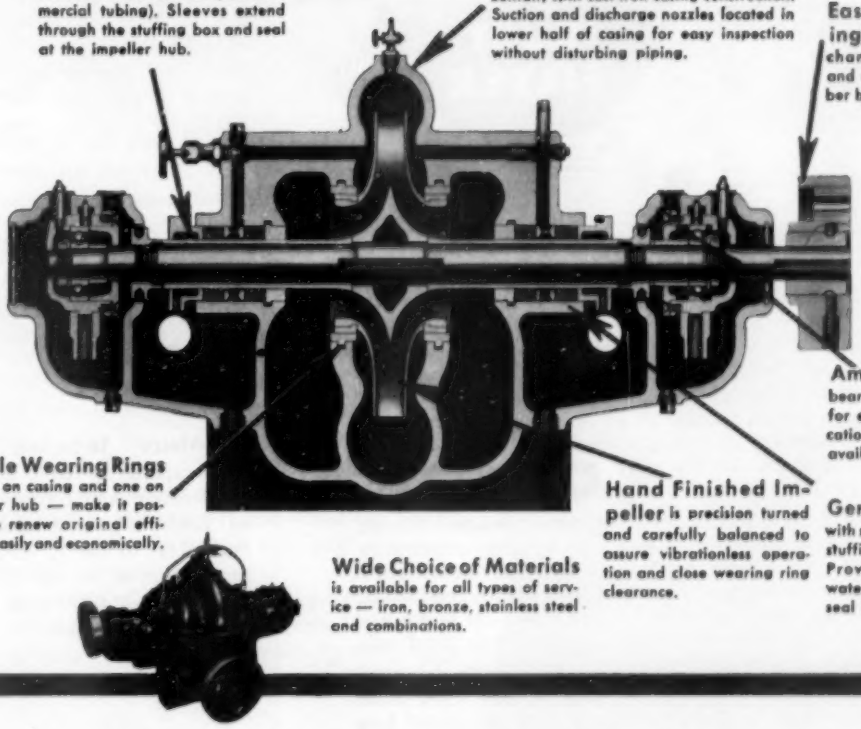
87—Hub-Fastening Device fastens hubs to shafts without splines or keyways. "Gripspring" is wedged between hub and shaft under pressure of hand tools. Outer ring expands, inner contracts. Maximum torque—full strength of hub and shaft is used. *U.S. Automatic Corp.*

88—Metalworking Lathe, long-bed "Delta," has 5-ft. bed—12 in. longer than standard model. Features: drive selector with single-lever control; perfected variable-speed drive; massive spindle construction with double bearing on spindle nose end. *Rockwell Mfg. Co.*

Turn the page

Get 8 Advantages of GOOD PUMP DESIGN

Double-Suction PUMPS



Longer Shaft Sleeve Wear with cast shaft sleeves (not commercial tubing). Sleeves extend through the stuffing box and seal at the impeller hub.

Greater Rigidity with heavy horizontally split cast-iron casing construction. Suction and discharge nozzles located in lower half of casing for easy inspection without disturbing piping.

Easy Coupling Mounting with *Magic-Grip* quick change bushings for pump and drive shaft. Pin and rubber bushing type usually used.

Ample Bearings — Ball bearings may be furnished for either oil or grease lubrication. Split shell bearings also available in larger sizes.

Double Wearing Rings — one on casing and one on impeller hub — make it possible to renew original efficiency easily and economically.

Hand Finished Impeller is precision turned and carefully balanced to assure vibrationless operation and close wearing ring clearance.

Generous Stuffing Box with sufficient packing to keep stuffing box maintenance low. Provision made for sealing water connection or grease seal if required.

Wide Choice of Materials is available for all types of service — iron, bronze, stainless steel and combinations.

HEAVY DUTY CONSTRUCTION with no skimping, no corner cutting is what you'll find in Allis-Chalmers double-suction pumps. Extra metal thicknesses, extra strong parts, extra features and extra careful workmanship add up to long life, low maintenance, and low cost per gallon pumped.

Every Allis-Chalmers double-suction pump is carefully tested on the most modern testing equipment in the industry. Each installation is individually engineered by men whose experience in thousands of pump installations will give exactly the right pump for your needs. Stock sizes from 10 to 7000 gpm with heads to 475 feet.

Complete Pumping Unit

Allis-Chalmers can furnish the complete installation — pump, motor, control and drive — all built of coordinated design and manufacture.

Whatever your pumping problem, call your A-C Authorized Distributor or District Office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 08B6146.

A-4590

ALLIS-CHALMERS

The new Schick plant at Lancaster, Pa., designed and built by The Austin Company, uses Sly Dust Filter to maintain a clean plant.

KEEPS SCHICK PLANT DUST-FREE

When The Austin Company designed the ultra-modern Schick, Inc., plant at Lancaster, Pa., it kept worker comfort in mind — realizing that efficiency is directly tied in with pleasant working conditions. That's why a Sly Dust Filter was included as an integral part of the design.

For just as the Schick Electric Shaver gives pleasant shaves, the Sly Dust Filter provides for pleasant working conditions. This powerful unit whisks dust away from seven different points in buffing operations—claims dust *at its source* to keep plant atmosphere fresh and clean. Only clean air is emitted to the outside — an extra dividend in community good will.

The Schick plant and Schick products are expertly designed and constructed. So, too, are Sly Dust Filters; they offer important advantages in greater filtering capacity, easier bag replacement, automatic control and other features which spell low-cost operation.

The new Schick plant is another graphic example of how alert planners make use of Sly Dust Filters to improve conditions, increase efficiency. If you have a dust control problem, look to Sly — since 1874 designer, fabricator and erector of the world's finest dust control systems. Write today for Booklet No. 98, "Dust Control by Sly."

Designers and Manufacturers of: Dust Control Systems, Blast Cleaning Equipment, Tumbling Mills, Industrial Ovens.

THE W. W. SLY MANUFACTURING CO.

SINCE 1874

4755 TRAIN AVENUE • CLEVELAND 1, OHIO

Visit Our Booth at the CHEMICAL SHOW Philadelphia, Dec. 5

Atlanta • Birmingham • Buffalo • Chicago • Cincinnati
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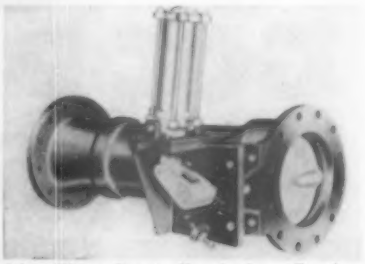
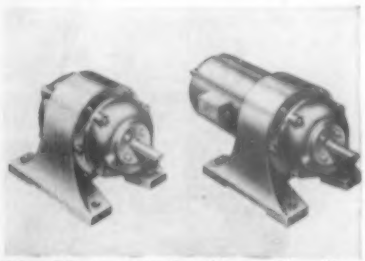
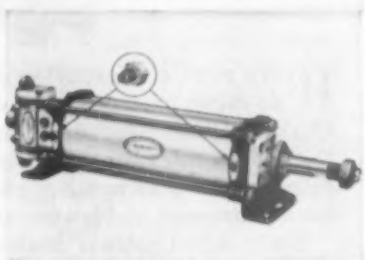


89—Flow Controller is for effective operation of water or waste. Accuracy within plus or minus 3%, 25-100% of maximum capacity. Model RCB-T features rugged construction, convenient installation, simple design, and low head loss. *Builders-Providence, Inc.*



90—Motor Induction Coupling varies speed; controls acceleration, deceleration and torque on variety of loads requiring speed regulation. 2:1 to 34:1, with constant torque output. ¾ hp. at 3400 rpm. to 75 hp. at 1700 rpm. *American Electric Motors, Inc.*



91—Air Motor, 2½-in. bore, has adjustable cushioning at either or both ends, effective on final ¾-in. of the stroke. Features built-in four-way valve. Operates at pressures to 175 psi.; thrust equals five times pressure applied. All mountings. *Bellows Co.*

Turn the page

Extreme Accuracy

...with a BULLARD Spacer Table

Builders of the P2V5 Neptune Anti-Submarine Aircraft, The Lockheed Aircraft Corporation, have this to say concerning their experience with the Bullard Spacer Table employed to machine a cast aluminum support for the Sonobuoy Chute.

"Before we used the Bullard Spacer Table, we put this kind of work (boring 3 holes of 5.250 diameter) either into a jig or on a horizontal boring machine".

"The reason we put this piece on the Bullard Spacer Table is that the holes are too large for a drill jig and dial spacing for hole location on the horizontal was time consuming. What is more remarkable about the Spacer Table is the fact that it can handle such large diameters with the greatest accuracy.

"Another advantage of the Bullard Spacer Table is the simplified tooling. All we need is a simple holding fixture. The spacing is done automatically by the Spacer Table".

these advantages can be applied to your machining problems. Ask your nearest Bullard Sales Engineer or Distributor or write us for Spacer Catalog

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

Anchor Heavy Machinery firmly with...

UNISORB®
MOUNTING PADS

No bolts, no lag screws, no holes to drill, no floor damage, eliminate up to 85% of transmitted vibration and noise.

Northern Metal Products Company says: "In September 1951, we came to the conclusion that there must be a better way to anchor our machinery to the floor, rather than using bolts. We decided to try Unisorb Mounting Pads, but to tell you frankly, we did not think they would do the job.

"In the course of 3 years' time we thought only of Unisorb when it became necessary to move machinery. In 1954 we moved to our new plant and went to Unisorb Mounting Pads 100% because in the past they had done such a wonderful job."

For complete information about this simplified machine installation method, return the coupon and ask for a copy of "Why It Pays to Anchor Machines with Unisorb".

THE FELTERS COMPANY
206 SOUTH STREET, BOSTON 11, MASS.

Offices: New York, Philadelphia, Chicago, Detroit, St. Louis
Sales Representative: San Francisco
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Mich.
Distributed by: THE INDUSTRIAL SUPPLY CO., Clinton, S. C.

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

TODAY . . . MAIL COUPON FOR UNISORB BOOKLET

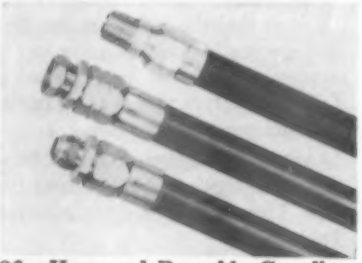
Please send my free copy of the booklet containing the complete story of UNISORB Mounting.

NAME..... TITLE.....
(Please Print)
COMPANY.....
STREET.....
CITY..... ZONE.... STATE.....

Return to: THE FELTERS COMPANY, 206 South St., Boston, Mass.

For more about these products, circle item numbers on Reader Service card next to back cover.

92—Hydraulic Vise is controlled by two simple foot pedals, leaving operator's hands free for handling and positioning. Model 1004 features power pump with replaceable cartridge that contains main check, release, by-pass relief valves. *Columbian Vise & Mfg. Co.*



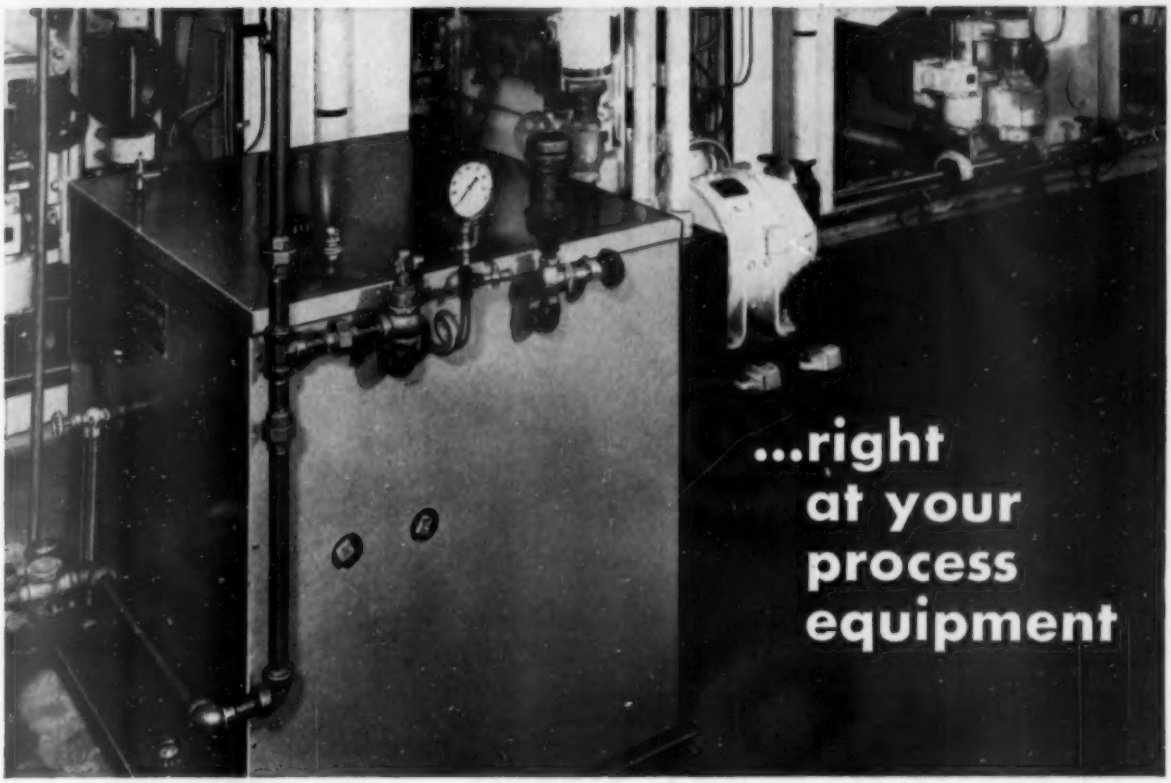
93—Hose and Reusable Couplings are offered in many types and sizes for making up assemblies for hydraulic, other heavy-duty jobs. Eliminate need for stocking many made-up assemblies. Simplified identification system makes assembly easy. *Imperial Brass Mfg. Co.*

94—Tape simplifies installation of heating and air conditioning systems. No. 691 is for sealing duct work in heating, ventilating, exhaust systems; holding building insulation materials; bundling sheet metals. Water-, moisture-resistant. *Permacel Tape Corp.*

Turn the page

for as little as $685

you can have high pressure steam



with a Pantex Speedylectric Steam Generator

Think of it! — Speedylectric lets you have constant temperature "dry" steam wherever you want it for as little as $685. Install it near your platen presses, or for degreasing, and phosphatizing, or on jobs that are remote from your central boiler. No fumes, no flame, no smoke-stacks or other complicated installation problems. Just plug in to either 220, 440 or 550v outlet, connect piping, and you have an ever-ready source of high pressure steam that you can control precisely.

Speedylectric utilizes the electrode principle — the simplest, lowest cost method for generating steam electrically. It has no coils, tubes or electric elements to scale and burn out. No feed water treatment or daily blow-down is needed. Equally important, Speedylectric is safe from fire dangers . . . no open flame or low water explosion hazards. (Underwriter's Laboratories Listing) 1 to 60 Bhp; 15 to 500 Psi. Why not write for complete data and illustrated Bulletin.

Speedylectric Steam-Jet Cleaner lets one man do the work of five. High pressure jet of dry steam and solvents quickly removes grease and dirt accumulations from machines and equipment *without* flooding floors. No need to stop nearby production or move machines outside. Completely safe and portable.

Pantex Manufacturing Corporation
Box 660H Pawtucket, R. I.
Send me complete illustrated data on:
☐ Pantex Speedylectric Steam Generators.
☐ Pantex Speedylectric Steam-Jet Cleaners.

NAME AND TITLE _____
COMPANY _____
ADDRESS _____

In Canada: Pantex Manufacturing, Ltd., 3556 St. Lawrence Blvd., Montreal

Removing dirt from floors in can manufacturing plant. Packaged cans in background.

he shaves off bumpy "stubble" to make trucking 50% easier

When floors grow beards of bumpy layers of grease-caked dirt, there's no faster "razor" than this—a powerful TENNANT Industrial Floor Machine.

At lightning speed it pulverizes and *picks up* grime from a 16" path . . . leaves a clean *level* surface that (by actual tests) saves up to 50% or more in power needed to propel lift trucks and other equipment.

REMOVES HEAVY GRIME IN 1 OPERATION

It's easy to "shave" a floor with this husky machine. Its high speed (1725 rpm) cleaning cylinder instantly pulverizes grease, dirt, tar, paint and other accumulations . . . shears off and picks up 8 to 20 lbs. per minute.

An exclusive planing action prevents usual gouging or digging. Instead it helps level humps and leaves a hard, smooth surface for fast, easy trucking. And, you use no water or chemicals; it's a rapid *dry* operation that a crew of men couldn't begin to equal in results. *Write for details; gas or electric models, many sizes.*

G. H. TENNANT CO., 2554 N. 2nd Street, Minneapolis 11, Minn.

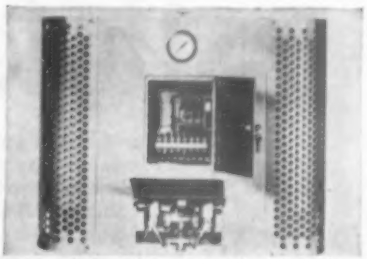
TENNANT FLOOR MACHINES

SPECIALIZED MAINTENANCE EQUIPMENT

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.

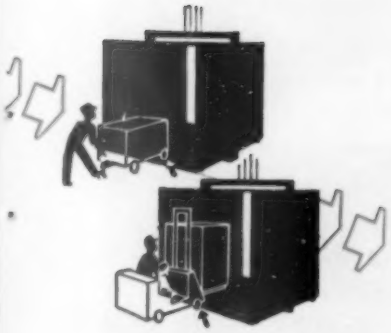
95—Lubricator provides centralized lubrication on small machines where minimum space is available. Cyclic type compact unit feeds controlled amounts of oil to as many as 25 bearing points on a machine. Powered by machinery it lubricates. *Bijur Lubricating Corp.*



96—Midget Dryer is ideal for drying small volumes of compressed gases to sub-zero dewpoints. Solid desiccant-type dehumidfier is completely automatic; electrically regenerated; has compact design for wall or bench mounting. Offered in three sizes. *Industrol Corp.*

97—Masonry Compound facilitates anchoring screws and nails. "Philplug" comes in loose fiber form. Moistened with water, it's rammed into hole any size, becomes part of material. Screw is inserted at once, carries weight immediately. *New England Carbide Tool Co.*

Turn the page

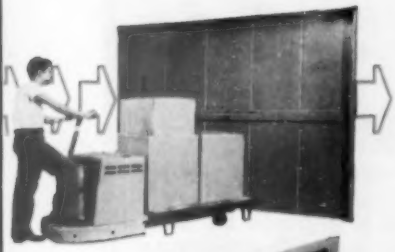


power trucks change the picture

It's necessary to change your thinking about freight elevators when you change from hand truck to power truck loading. A hand truck weighs about 500 pounds. Its relatively small pay loads are pulled into the elevator and distributed by hand. Full car loading is gradual. And the extra weight of the hand truck is unimportant. This type of traffic is easily handled by a conventional freight elevator. However, power truck loading completely changes this picture. A power truck may weigh 8,000 pounds, or more, plus its heavier pay load. It travels fast and stops quickly. Obviously, this type of traffic can be handled safely only in freight elevators and hoistways that have been specifically designed to take power truck "punishment"—as described in detail in Otis Heavy Duty Freight Elevators booklet B-705.

easily installed for light freight

Otis Light Duty freight elevators have a semi self-supporting framework that permits installation in new and existing hoistways without reinforcing the building, or adding overhead supports, or building a penthouse. They can be used for any rise up to 35 feet at a speed of 25 feet per minute with lifting capacities of 1,500, 2,000 and 2,500 pounds. They're described in Otis booklet B-720.



protective screen of safety

Otis engineers have developed a screen of safeguards around freight elevator entrances. A modern Otis freight elevator cannot be started until all car and hoistway doors are closed, and none of them can be opened while the car is moving through the hoistway. Doors can be opened only at a landing where the car is leveling or stopped. Power-operated Otis Hoistway Doors, for new or modernized installations, are described in booklet A-389.

freight elevators up-to-date?

A modern freight elevator is an efficient, safe, production tool for reducing materials handling costs. You can have freight elevators where you want them, when you want them—with or without attendants. Our unmatched experience in all fields of elevatoring qualifies us to advise on standard use or on special adaptations of Otis freight elevators for completely automatic production lines. This experience is available for any size installation, however large—or small!

the heart of the installation

You can look to your Otis gearless hoisting machine for almost endless service. You'll never wear it out. We'll tell you why. Otis machines are not adaptations of standard commercial equipment. They're specifically designed to meet the unique requirements of elevator service. All parts are built in Otis plants under rigid quality control. Another reason why the Otis trademark is the symbol of the world's finest elevators.

OTIS ELEVATOR COMPANY, 260 11th Ave., New York 1, N.Y.

OFFICES AND SERVICE IN 295 CITIES ACROSS THE U. S. AND CANADA

directional arrows

for MATERIALS HANDLING

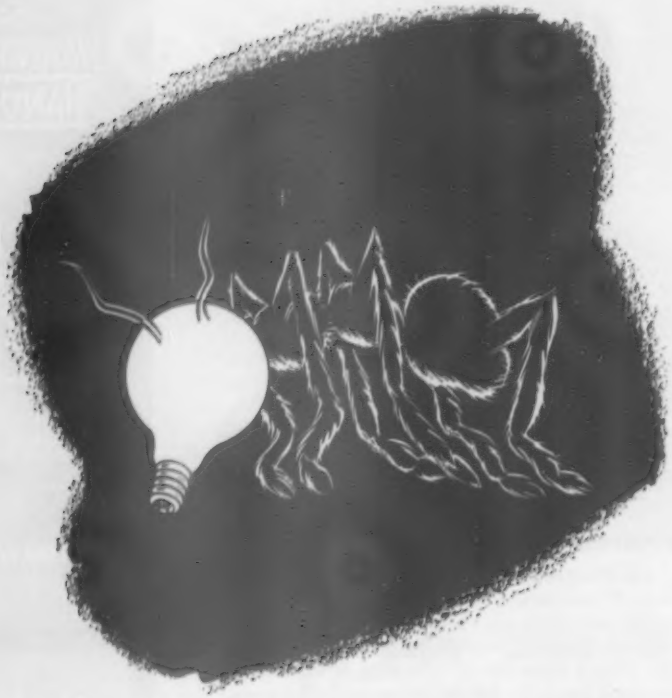
- Light, General and Heavy Duty FREIGHT ELEVATORS
- DUMBWAITERS
- HOISTWAY DOORS
- MODERNIZATION
- MAINTENANCE
- PASSENGER ELEVATORS

Otis

GOT

RESIST-ANTS

IN *Your* PLANTS?



Resist-ants march off with chunks of power where plant lighting efficiency lags. Keep free of these pests by putting into practice the suggestions in the *Champion Maintenance Manual** and by keeping an ample supply of efficient CHAMPION Lamps on hand.

CHAMPION *Lamps*

* *May we mail you a copy?*
Free to anyone within the borders of the United States.

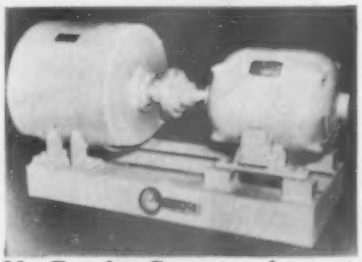
CHAMPION LAMP WORKS

308 Lynnway, Lynn, Massachusetts

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products circle item numbers on Reader Service card next to back cover.

98—Trailer permits palletless handling. Deck is made of oblong bars welded to frame at 2-in. intervals. Fork trucks can insert multiple forks between bars to pick up loads. Fitted with couplers for "trackless train" operation. Holds 2 tons. *Mercury Mfg. Co.*



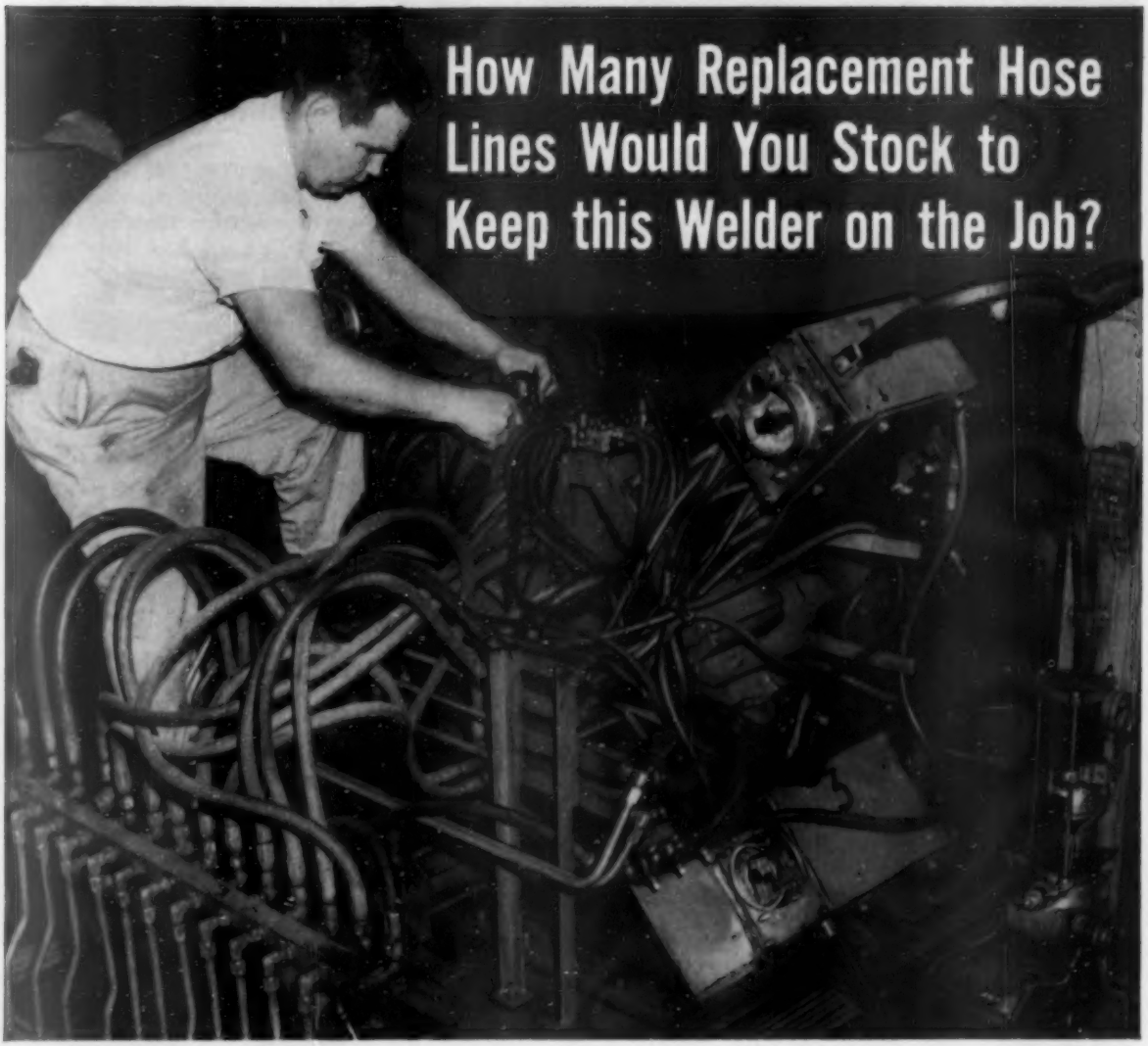
99—Rotating Generators, low cost, high frequency, make ultrasonic processing practical for full-scale production. Supply economical power for transducers needed in soldering, drilling, grinding, plating, cleaning, degreasing. 2-150 kw. *Acoustica Associates, Inc.*

100—Runner Matting of Koroseal is designed for heavy traffic—light gray in wide-ribbed, easy-to-clean pattern. Resists oil, grease, most solvents; heat will not cause it to become sticky. Resists abrasion; does not crack, chip, peel. *B. F. Goodrich Co.*

101—Electronic Receiver-Recorder for d-c pick-ups and telemetering combines four records from d-c pick-ups, a-c pick-ups, or pneumatic transmitters on same, uniformly graduated, circular chart. Eliminates individual records; saves panel space. *Bailey Meter Co.*

Turn the page

How Many Replacement Hose Lines Would You Stock to Keep this Welder on the Job?



At General Electric's Major Appliance Division in Louisville, Ky., this resistance welder fabricates cooking range bodies. 160 hydraulic lines are used on the equipment that positions each range body as it feeds through the welder.

G. E. maintenance men can replace any worn hose line from a surprisingly small supply of Aeroquip bulk hose and reusable fittings. It takes only minutes to assemble the hose and fittings using ordinary shop tools.

In your plant, too, the Aeroquip bulk hose method can save replacement time and eliminate the need for stocking pre-assembled hose lines. Check your Yellow Pages for your local Aeroquip distributor or write us.

Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

85% More Storage Space with CHICAGO TRAMRAIL TRAK-RAK STORAGE SYSTEMS

TRAK-RAK Interlocking Transfer System which permits two hoisting columns to serve four bays.

The Chicago Screw Co. increased pallet storage over 85% in the same storage space in each of four bays with TRAK-RAK Crane System, storing 2100 pallets in the same space formerly required for 1120 pallets.

The Chicago Screw Co. also saved many man hours due to the simplicity and maneuverability of the TRAK-RAK System which allows accurate placing of materials in and out of the storage area.

The original installation served an approximate area of 9,000 sq. ft., with an interlocking transfer system which allows the movement of the hoisting columns from one bay to another. Due to the extreme flexibility of TRAK-RAK Systems, additions can be readily made in most installations. Since the original installation, The Chicago Screw Co. has added a fourth bay which interlocks with the three previous bays.

This system is an under running transfer system; however, TRAK-RAK Systems can also be furnished as top running or self-contained systems operating on rails mounted directly on top of the racks.

ASK FOR COMPLETE INFORMATION . . . descriptive catalog, pictorial record of various applications and engineering data.

CHICAGO TRAMRAIL CORPORATION
4000 West Washington Boulevard • CHICAGO 24, ILLINOIS

FACTORY / EQUIPMENT NEWS

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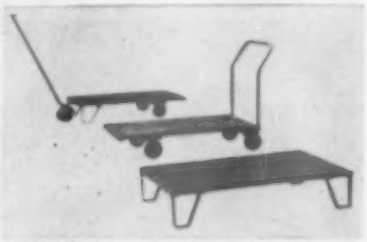
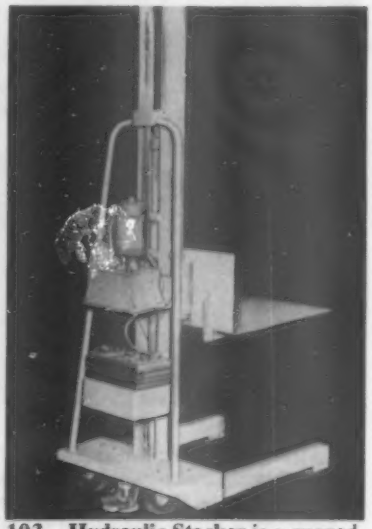


102—Skids, Semi - Skids, Floor Trucks feature all-steel welded construction. Skids provide four-way entry for lift trucks. Semi-skids can be used with lift trucks or jacks. Floor trucks have outside stake sockets for maximum deck use. *Market Forge Co.*



103—Hydraulic Stacker is a rugged, compact unit for lifting and transporting loads to 500 lb. "Tubarlift Jr." lifts to 60 in. from floor; lowered platform height is 5 in. Platform size is 20x24 in. Manual or electric lifts. Positive floor lock. *Uhrden, Inc.*

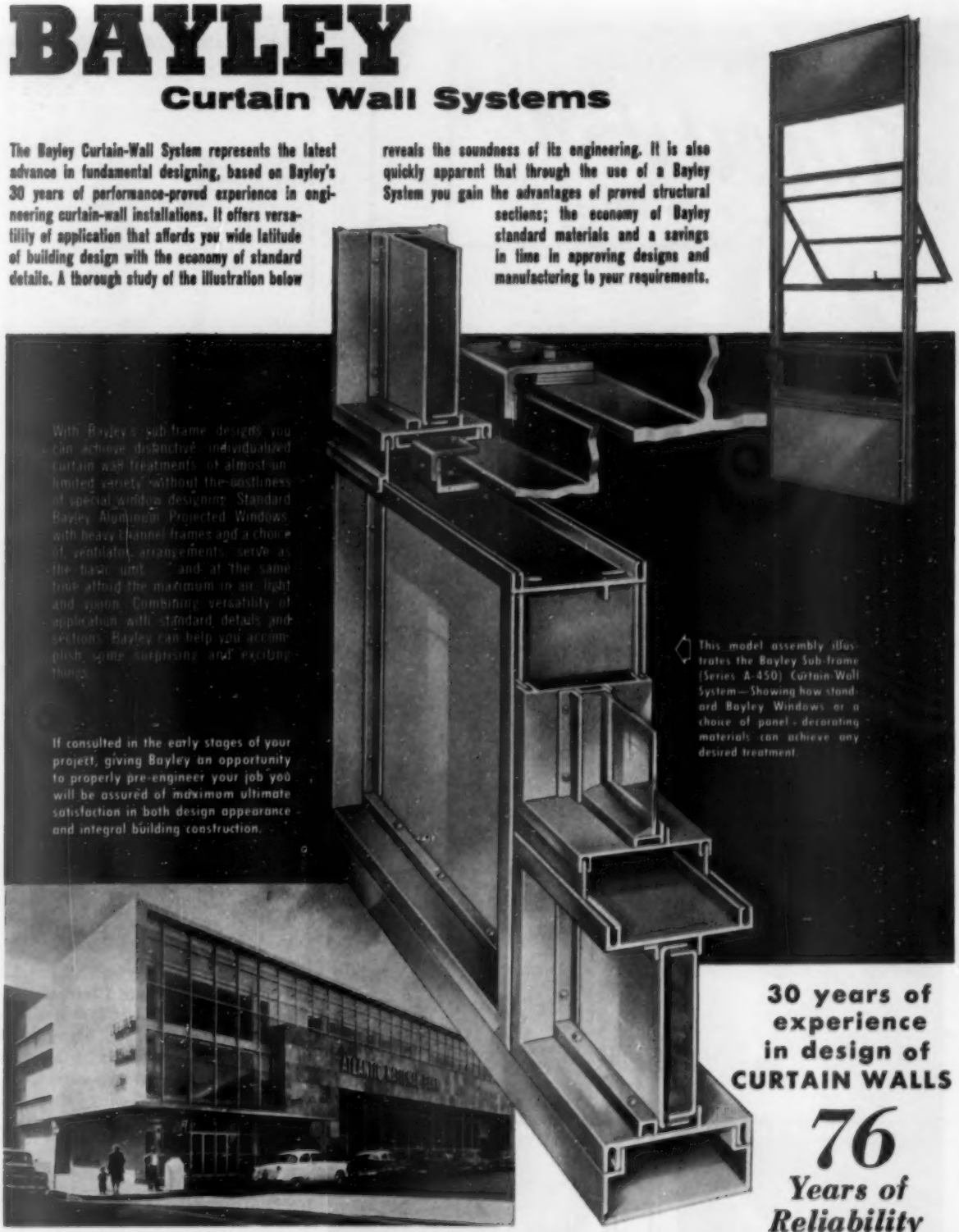
104—Grinding Wheel features new resinoid bond. Used with new molding and firing techniques, B11 bond insures more uniform structure and spacing of abrasive grains. Gives greater accuracy, improves surface finishing, reduces diamond truing tool costs. *Norton Co.*

Turn the page

BAYLEY

Curtain Wall Systems

The Bayley Curtain-Wall System represents the latest advance in fundamental designing, based on Bayley's 30 years of performance-proved experience in engineering curtain-wall installations. It offers versatility of application that affords you wide latitude of building design with the economy of standard details. A thorough study of the illustration below reveals the soundness of its engineering. It is also quickly apparent that through the use of a Bayley System you gain the advantages of proved structural sections; the economy of Bayley standard materials and a savings in time in approving designs and manufacturing to your requirements.



With Bayley's sub-frame designs you can achieve distinctive individualized curtain wall treatments of almost unlimited variety without the costliness of special window designing. Standard Bayley Aluminum Projected Windows with heavy channel frames and a choice of ventilator arrangements serve as the basic unit . . . and at the same time afford the maximum in air, light and vision. Combining versatility of application with standard details and sections Bayley can help you accomplish some surprising and exciting things.

If consulted in the early stages of your project, giving Bayley an opportunity to properly pre-engineer your job you will be assured of maximum ultimate satisfaction in both design appearance and integral building construction.

This model assembly illustrates the Bayley Sub-frame (Series A-450) Curtain-Wall System—Showing how standard Bayley Windows or a choice of panel-decorating materials can achieve any desired treatment.

Atlantic National Bank, West Palm Beach, Fla. **Architect—S. L. Shepherd Builder—Arnold Construction Co.**

30 years of experience in design of CURTAIN WALLS

76 Years of Reliability

See Bayley's catalogs in Sweet's . . . aluminum windows 17a/Bay; and steel windows 16b/Ba; or ask us for individual reference-file copies. Write for special file on Bayley Curtain Wall Ideas, Designs and Details.

The WILLIAM BAYLEY Co.

Springfield, Ohio *Agents in All Principal Cities*

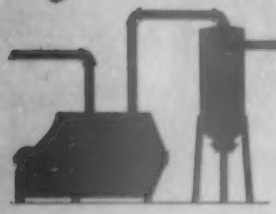
District Sales Offices:

Springfield • Chicago 2 • New York 17 • Washington 16

WHAT SPENCER

Vacuum

DOES:



This is a diagram of the Spencer Stationary Vacuum System, with vacuum pipes extending to all parts of the plant. Special vacuum tools, automatic dumping equipment, conveying hot materials and a hundred other developments provide for individual conditions.

Spencer Vacuum is the modern tool of many uses in industry. First; housekeeping and sanitation—faster, better and at lower cost.

Second; big advances have been made in applying vacuum to the production line—reclaiming automatically, conveying raw and waste materials by the ton and doing a hundred jobs which are not practical by hand or any other method. Spencer offers the most complete line in both the stationary installed type and heavy duty portable machines.

For data on types of equipment and tools, selection charts and illustrations of special applications, ask for the new Bulletin No. 155.

The Spencer Turbine Company
Hartford, Connecticut

SPENCER
HARTFORD

499-B

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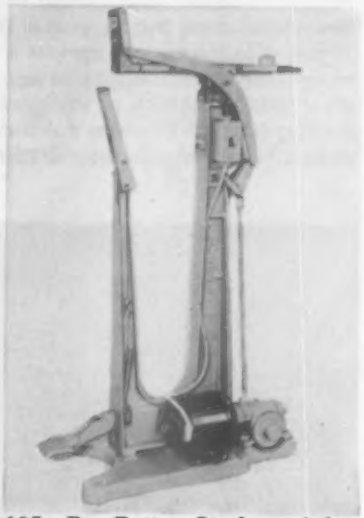
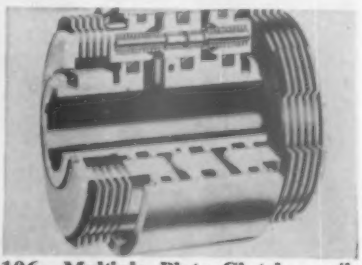
For more about these products, circle item numbers on Reader Service card next to back cover.



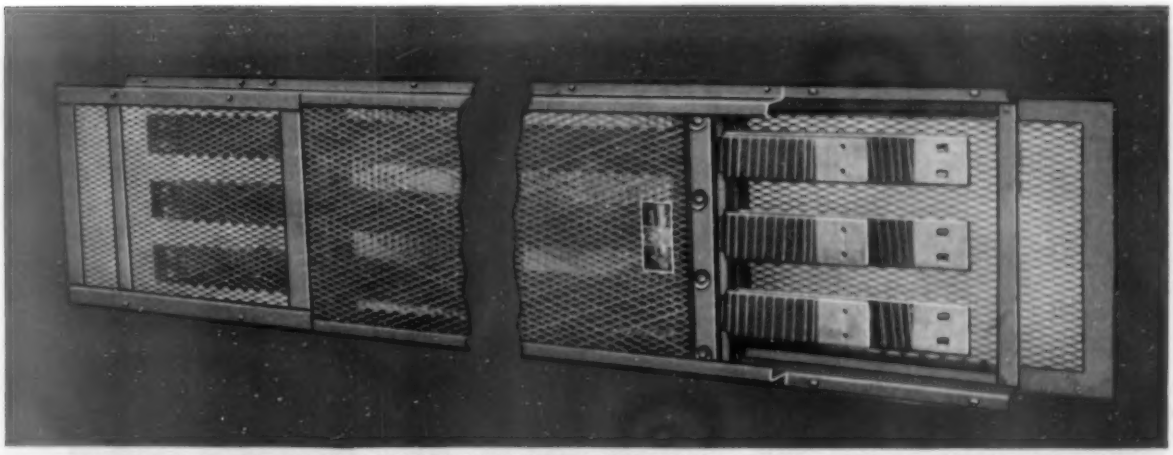
105—Box Bottom Stapler seals box bottoms with fewer staples—3 or 4 do work of 12 to 16. Drives heavy-duty, copper-coated staple, which straddles seam where outside flaps meet; fastens them to inner flaps. Spaced 5-in. apart. F94 for foot or motor operation. *Bostitch.*



106—Multiple Plate Clutches, oil-actuated, are ideal for machine tools. High energy, high inertia, high horsepower units adapt to applications creating high temperature, under heavy loads. Remote or push-button control. Single and duplex. *Twin Disc Clutch Co.*

107—Electrical Tape, pressure-sensitive aluminum foil, creates moisture vapor barrier in communication cable splices. For plastic-insulated, plastic-sheathed cable splices, and where they're spliced to paper-insulated, lead-sheathed cable. *Minnesota Mining & Mfg. Co.*

Turn the page

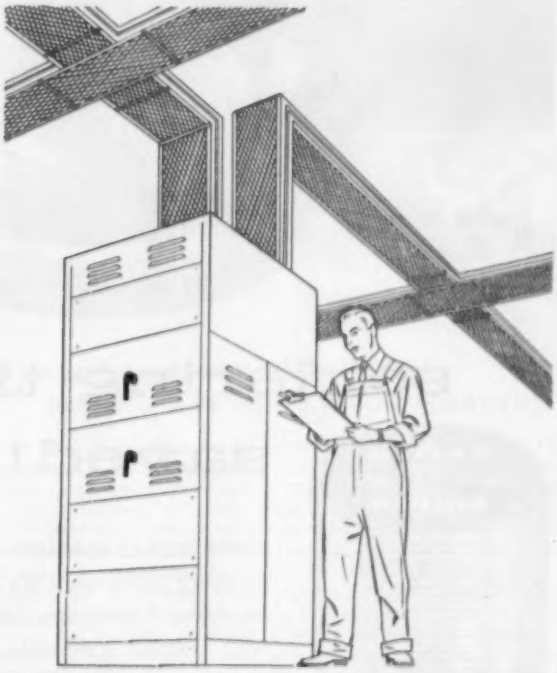


EXCLUSIVE SCARF-LAP CONSTRUCTION PROVIDES EXTRA-HIGH RIGIDITY AND STRENGTH. Duct sections come in tailored lengths, simply overlap and bolt together. Bulky, complicated joint fittings are eliminated. Elbows, tees and cross sections allow flexible installation anywhere. Exclusive paired-phasing arrangement assures lowest possible current carrying cost per ampere per foot.

BULLDOG LO-X BUS DUCT WITH LIGHTWEIGHT

Aluminum Bus Bars

costs less to buy—
less to install



LOWER OPERATING COSTS! LESS DEAD WEIGHT ON TRUSSES AND SUPPORTING MEMBERS!

You benefit two ways when you install BullDog Lo-X Bus Duct with lightweight aluminum bus bars: (1) You save money. (2) You get a more flexible, more efficient feeder system.

The weight saved by using aluminum cuts handling and installation costs. This, plus lower first cost, are prime reasons for the widespread use of BullDog aluminum bus duct in plants everywhere. What's more, this weight-saving eases the strain on building superstructures and other supporting members.

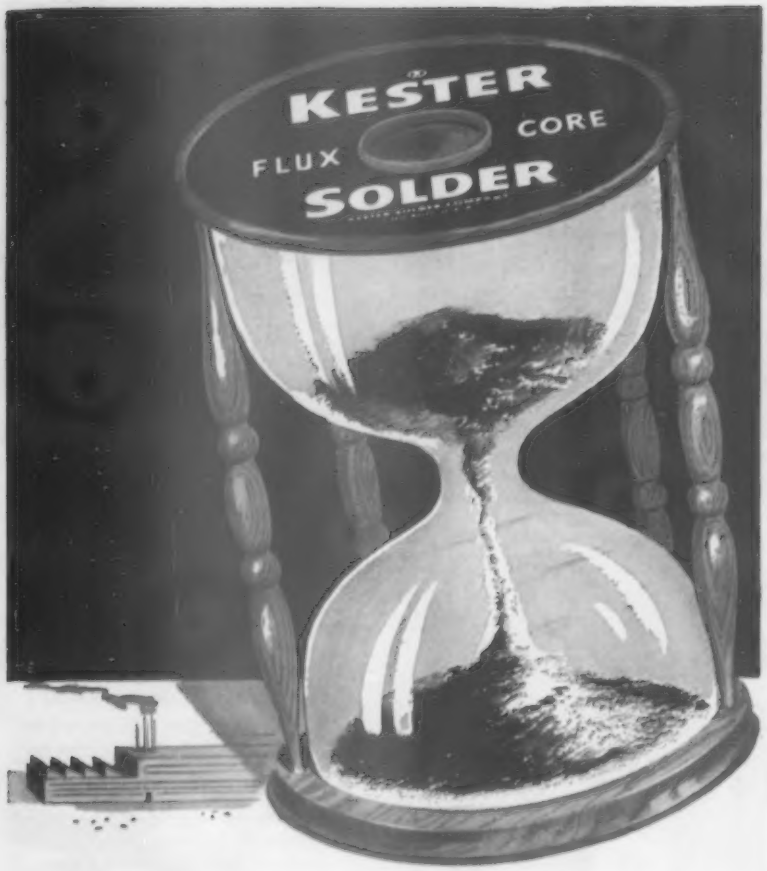
Dependable BullDog Lo-X Bus Duct is both efficient and flexible—can be easily relocated to fit any plant rearrangement. Let your BullDog Field Engineer or Qualified Distributor tell you about the *many* advanced BullDog products. Or write: BullDog Electric Products Company, Detroit 32, Michigan.

©BEPCO

IF IT'S NEW
. . . IF IT'S DIFFERENT
. . . IF IT'S BETTER . . . IT'S

BULLDOG
ELECTRIC PRODUCTS COMPANY
A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, New York. ***In Canada:*** BullDog Electric Products Company (Canada), Ltd., 80 Clayson Road, Toronto 15, Ontario.



soldering time saved!

KESTER FLUX-CORE SOLDER saves plenty of time on every job because it's work-formulated to increase soldering speed and efficiency. That's why everyone's switching to Kester . . . the right name to remember for top quality solder.

THIS IS IT . . . the informative 78-page Kester textbook "SOLDER . . . Its Fundamentals and Usage." Send today!

KESTER SOLDER COMPANY 4213 Wrightwood Avenue, Chicago 39, Illinois
Newark 5, New Jersey • Brantford, Canada

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For more about these products, circle item numbers on Reader Service card next to back cover.

108—Portable Pump is ideal for quick, emergency use. Combats flooded floors and standing water on flat roofs. Weighs only 26 lb., complete with ¼-hp. motor, hinged carrying handle, vacuum switch. Capacity is 5 gal. per minute; to 30 psi. *Hypro Engineering, Inc.*

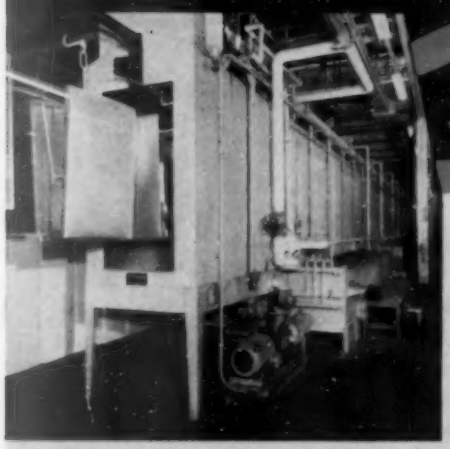
109—Arcwelder is for inert-gas-shielded consumable electrode welding. Airco 800 Ampere TCV Rectifier features constant arc voltage for all automatic machine welding applications employing constant speed wire feed. Voltage may be pre-set. *Air Reduction Sales Co.*

110—Heat Curing Tapes for electrical and electronic applications have excellent self-sticking characteristics in uncured state; firmer adhesive, increased holding power, and solvent-resistance when cured with heat. "Mylar" 254 and 255. *Permacel Tape Corp.*

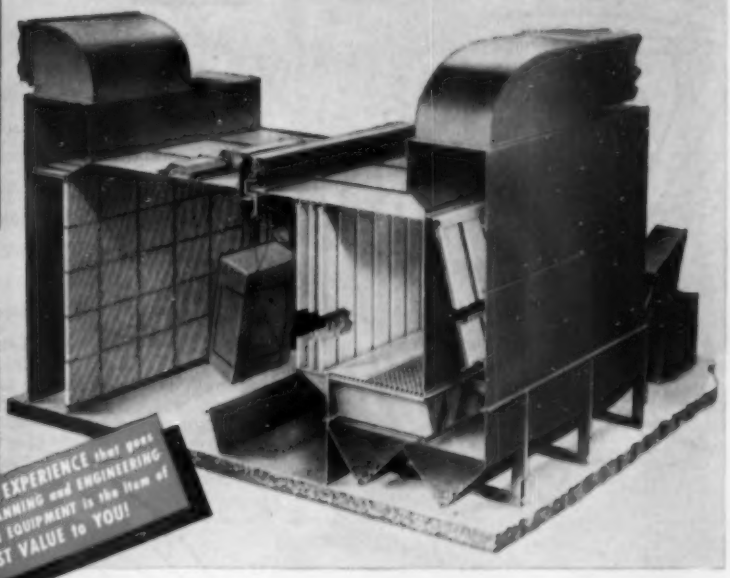
Turn the page

COMPLETE *Finishing* SYSTEMS

. . . for ENAMELS • LACQUER • PAINT • VARNISH

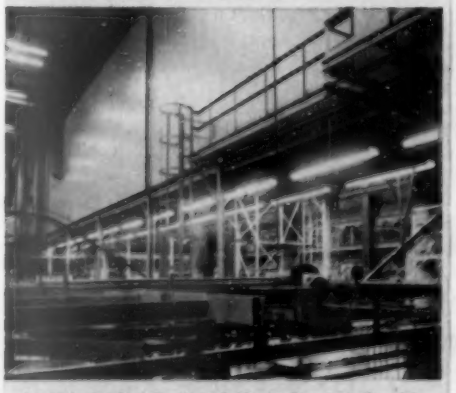


One of Two Mahon Seven-Stage Metal Cleaning and Rust Proofing Machines designed for processing Refrigerator Parts and installed in the plant of one of the world's largest manufacturers of Home Appliances.



. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the Item of GREATEST VALUE to YOU!

One of Four Mahon TYPE 54 AC-F PUMPLESS Hydro-Filter Spray Booths installed in the Porcelain Enamel Finishing Line of the same manufacturer referred to above. Note tubular sludge unloading conveyor casing at bottom of sludge tank.



Mahon Double-Deck Overhead Frit Drying Oven in the Porcelain Enamel Finishing Line of the same manufacturer referred to above. Other Mahon equipment in this finishing operation includes Dry-Off Ovens, Cooling Tunnels, Brushing Booths, Touch-Up Booths, Filtered Air Supply System and other Special Items.

PUMPLESS Hydro-Filter SPRAY BOOTH is Highly Successful in FRIT SPRAYING OPERATIONS!

Mahon Type 54 AC-F Hydro-Filter Spray Booth, designed especially for Frit Spraying in porcelain enameling operations, is a departure from the conventional water-wash spray booth. There are no recirculating pumps. The normal exhaust fan, used to ventilate the spray booth, provides the washing action through air accelerators which impinge the airborne frit particles into the surface of the water in the sludge tank. Dry baffle plates are provided in front of the Hydro-Filter chamber for maximum recovery of Frit. The bottom of the sludge tank is in the form of two "V" shaped hoppers with the continuous conveyor of the automatic sludge unloader at the bottom. In the development of Type 54 AC-F, Mahon engineers have not only produced a highly effective Frit Booth, but, through elimination of high pressure pumps and the addition of the automatic sludge unloader, have reduced operating cost and maintenance to an absolute minimum. If you have a finishing problem, or are contemplating new finishing equipment, you will find that Mahon engineers are better qualified to advise you on both methods and equipment requirements . . . and better qualified, also, to do the all-important planning and engineering of equipment—which is the key to fine finishes at minimum cost. No matter what you paint, or by what process, Mahon equipment will serve you better . . . because its engineered better and built better for more economical operation over a longer period of time. See Mahon's Insert in Sweet's Plant Engineering File, or write for Catalog A-656.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES ENGINEERING OFFICES in NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling, and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

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FOR INDUSTRIAL MACHINES

The mark of an Extra Dependable machine

From America's foremost producer of custom designed motors come these premium-built, *extra dependable* E.D. "power packages" for general industrial use—75 years in the making—yours today *at no extra cost!*

1 to 250 hp. AC and DC. N.E.M.A. standards.

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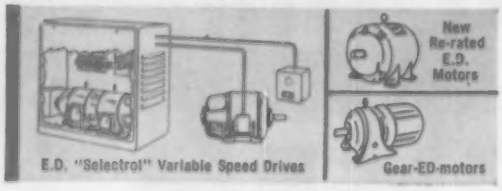
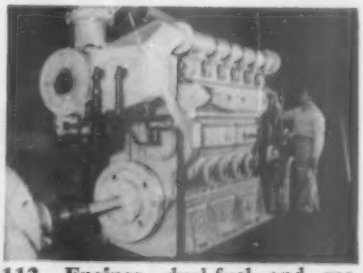


FACTORY / EQUIPMENT NEWS

Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back page.

111—Polishing-Grinding Wheel removes stock while polishing, conforms to shape of object, removes mild draw marks in one process. Consists of hundreds of pieces of cloth-coated abrasives formed into wheel. For automatics, lathes, hand use. *Minnesota Mining & Mfg. Co.*

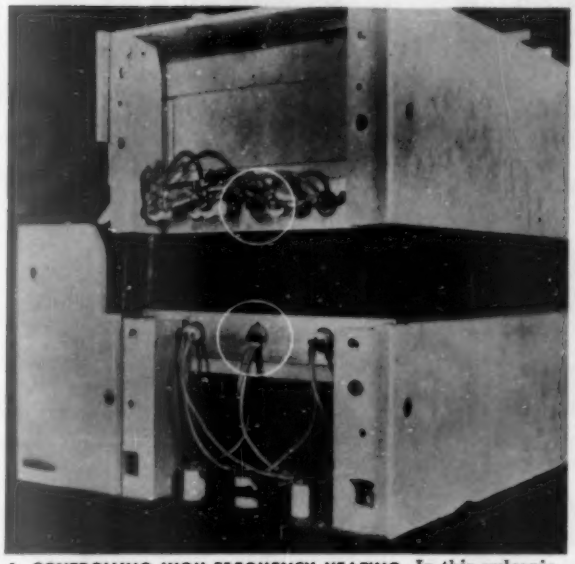


112—Engines, dual-fuel and gas, are moderate-speed, 4-cycle, heavy-duty diesel units, with ratings to 1400 hp. "Jet-Swirl" feature of W-9's allows ramming larger and more turbulent air charges into cylinder. Cleaner, more complete combustion. *Worthington Corp.*

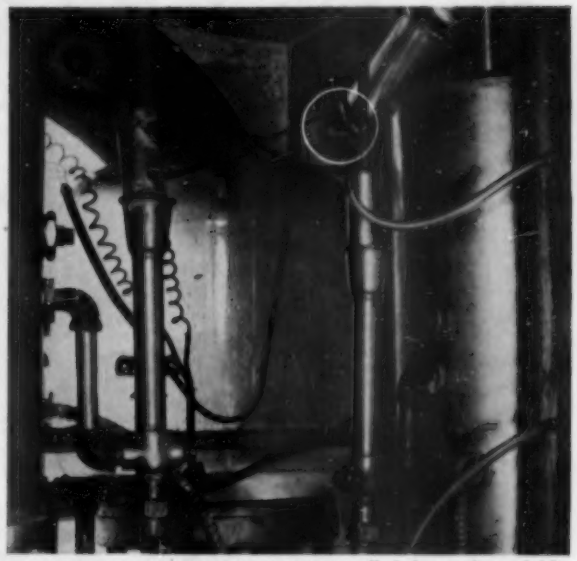
113—Stock Feeder provides for reloading multiple spindle screw machine without stopping machine each time previously fed stock is used up. Allows one man to easily operate a number of machines. Eliminates need for feed fingers and tubes. *Roll-O-Matic Industries.*

Turn the page

How would you solve these tricky temperature control problems?



1. CONTROLLING HIGH FREQUENCY HEATING. In this vulcanizing patch press, precise temperature control of the platens was required to prevent loss of electronic heat generated within the processed material. Fenwal's solution was two THERMOSWITCH® units, set at 400F, mounted on the platens. Result: a production rate of 3,000 patches per hour, compared to ordinary hot press methods of 30 per hour.



2. SAFETY IN A DISTILLING PROCESS called for a dependable failure alarm. A Fenwal THERMOSWITCH unit in the condenser's safety vent solved the problem. Now, should the cold water supply fail, steam blowing through the condenser tubes will hit the THERMOSWITCH unit. This control, set at 120F, will then open, shutting off the electric heaters and sounding a continuous alarm.

3. PROTECTING PRODUCTS. In this shoe lining smoother, the problem was twofold: to use the fewest possible thermostats; provide close temperature control in order to prevent burning of shoe leather. Fenwal's solution: a single adjustable THERMOSWITCH unit, mounted on one ironer and controlling two ironers. This halved the number of thermostats indicated, while providing precision temperature control.

4. SEND FOR NEW CATALOG, just off the press. It describes Fenwal's complete line of THERMOSWITCH units and new indicating controllers for industrial applications. Fenwal engineers are always glad to help on any of your temperature control problems. Write **Fenwal Incorporated, 611 Pleasant St., Ashland, Massachusetts.**

Fenwal

THERMOSWITCH®

Controls Temperature — Precisely

It Pays To Take a

Plant-Wide Look

at Weighing!

A Modern Weighing System Makes the Big Cost-Control Difference

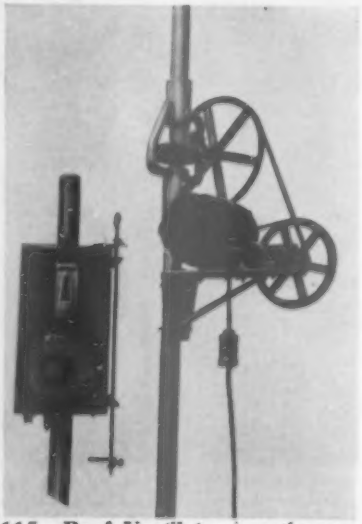
Today it's more than ever important to think of weighing not in terms of isolated scales, but as a vital part of your overall quality-control and cost-control system. This means the right scales in the right places . . . to provide basic accounting records of materials received, processed, shipped or transferred. Weight records that originate at scales directly affect costs, inventories and customer billings. Weighing errors cannot be corrected later—weights must be right the *first* time. That's why it's so important to have a modern weighing *system* for top efficiency in your plant operations.

May we tell you more about the "weighing system plan"—and its application to your requirements? Write to . . . Toledo Scale Company, Toledo 1, Ohio.

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.

114—Solenoid Valve, full port, normally closed, operates and holds fully open with low or no flow pressure at all. Type G is suitable for lines feeding gas to burners of ovens, furnaces, boilers; for vacuum lines; for controlling liquids. *Magnatrol Valve Corp.*



115—Roof Ventilator is a thermostatic device that may be set for any degree of opening; stops at any point of temperature equalization. Comprised of motor, gearing, electronic control. Can adapt to control fans, other devices. *Metropolitan Greenhouse Mfg. Corp.*

Turn the page

CHOOSE FA *SCSD OR SAHD enclosed*
SHUTLBRAK SWITCHES

FA TYPE SCSD — Standard Duty — is a combination of interlocking and non-interlocking switch with full opening cover. Kamklamp pressure type fuseholders with solderless pressure connectors, "on" and "off" indicated by handle position are other features of this unit. The rotary handle is arranged for 4 paddocks in "on" or "off" position.

Switch capacities are 30 to 200 amps., 250 volts AC or DC and 600 volts AC 2 and 3 pole single throw. Available with solid neutrals.

FA TYPE SAHD — Heavy Duty — has an interlocking fuse door which automatically locks when the current is "on" and permits access when the switch is "off." (An intermediate position of operating handle provides access only to authorized persons.) Handles are arranged with paddocks in "on" or "off" position.

Switch capacities are 30 to 1200 amperes with front operated handles, 250 volts AC or DC or 600 volts AC in 2, 3 and 4 pole single throw.

Approved by the Underwriters' Laboratories, Inc., for label service, FA type SCSD and SAHD operating switches effectively answer industry's need for either a **standard** or **heavy duty** switch.

Built for long-lasting and trouble-free service, both switches are horse-power rated and feature quick-make and quick-break, made possible by a shuttle mechanism with heavily silvered contacts which roll under pressure and improve with use.

If you want a high quality standard or heavy duty switch — one that will give long, safe and dependable service — choose FA type SCSD or SAHD.

Your nearest FA representative listed in Sweet's will be glad to give you complete details. Or better still see these switches at your nearest FA distributor.

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Frank Adam Electric Co.

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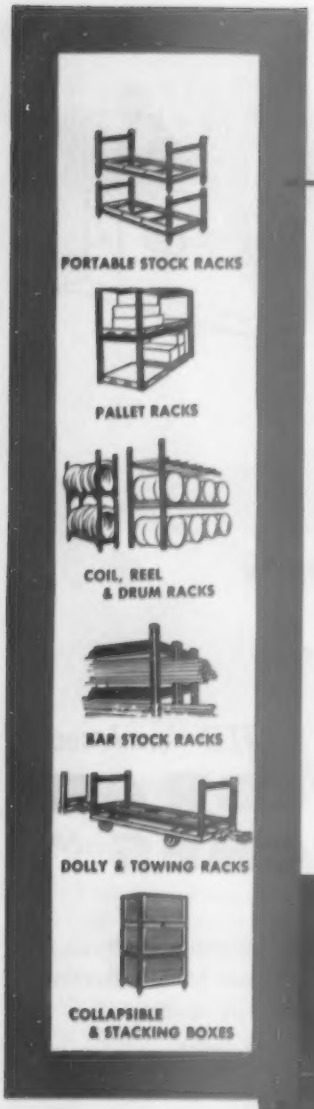

YOU CAN STACK ANYTHING ON.. E M I RACKS

be a good "warehouse-keeper" keep your materials

well stacked!

Equipment Manufacturing storage racks that stack are fabricated of strong, square tubular steel and are adjustable to fit any space or unit load in your plant or warehouse. Special racks designed to your specifications. Field Engineering Service on any installation. Before you decide on a new warehouse, additional storage space or the purchase of stacking equipment, write for our catalog. You save money, space and time with E. M. I. racks.

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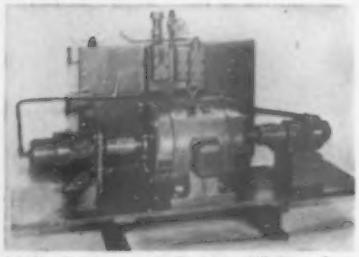
MATERIALS HANDLING EQUIPMENT STACKING RACKS FOR INDUSTRY

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back cover.



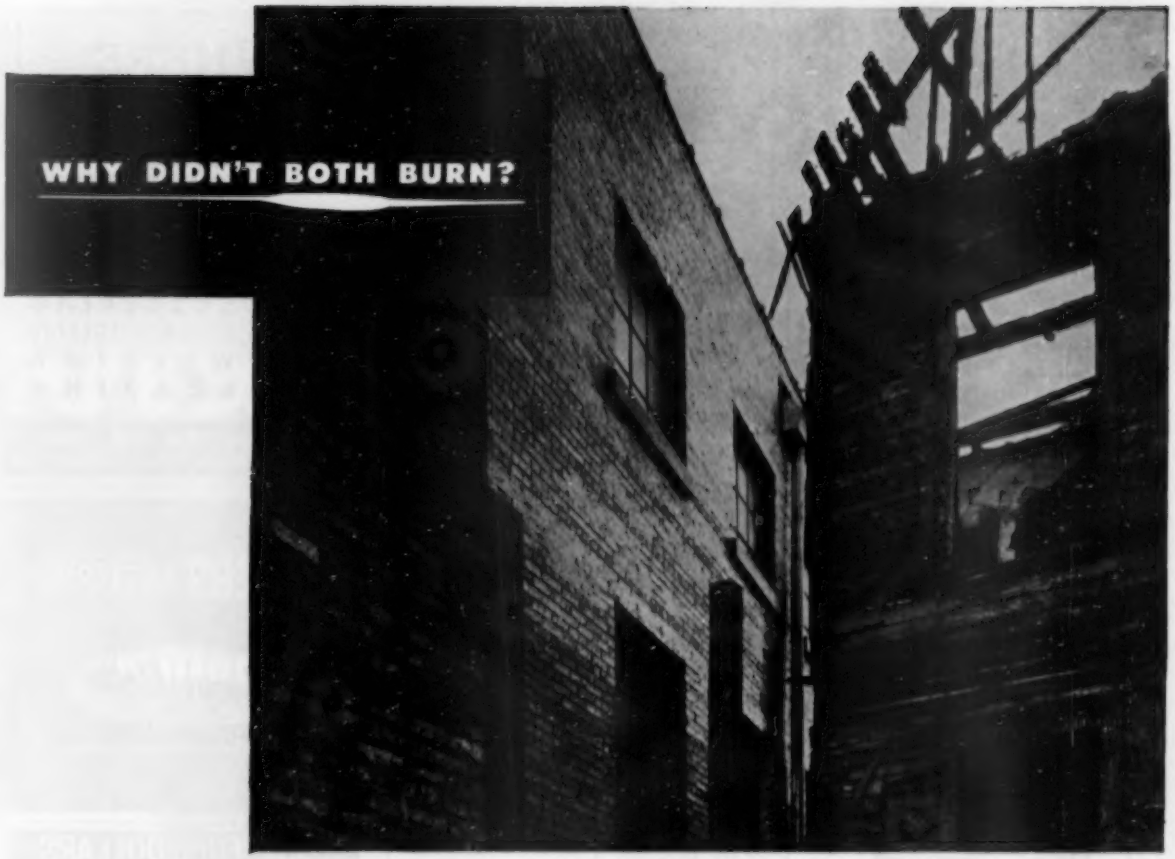
116—Press and Power Unit, electrically driven, hydraulic, has steel blocks drilled with oil passages to replace 40 ft. of exposed piping included on previous type. "Unitrol" prevents burst lines and simplifies valve maintenance. *Clifton Hydraulic Press Co.*

117—"Fringecount Micrometer" utilizes wave-length of light to make direct linear measurements within one-millionth of an inch. Useful where high accuracy serves as "safety factor" for less precise measurements; and as precision comparator. *Link Aviation, Inc.*

118—Relay provides over-voltage protection. Under test, it has proved virtually environment-free. Designed primarily for aircraft use, but simplicity and long-life reliability make it valuable for many automation circuits now being evolved. *Jack & Heintz, Inc.*

119—Pushbutton Control, variable speed (a-c or d-c) features 5-step control. Operator starts motor slowly by pressing button to first step; then other four for higher speeds. Any of five speeds can be held in accelerating or decelerating motor. *Harnischfeger Corp.*

Turn the page



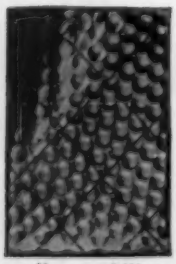
Mississippi Wire Glass Helps Protect Buildings Against Tragic, Costly Fires

When fire utterly gutted this building, it was unable to spread to the neighboring structure because Mississippi Wire glass windows, in metal frames, efficiently prevented windblown sparks and searing heat from reaching the interior. For though cracked by heat or smashed by a blow, wire glass tends to remain in the opening . . . continues to offer utmost protection at minimum cost.

And these same properties enable Mississippi Wire Glass (Approved Fire Retardant No. 32) to help bottle up fires and prevent them from roaring into a costly tragedy like that above.

Mississippi Wire Glass has saved many lives and millions of dollars' worth of property from fiery destruction. It is recommended for installation in windows, skylights, partitions, doors and in all other vulnerable locations where fire or breakage protection with daylighting is desired.

Fence out fire. Specify Mississippi Wire Glass . . . the original wire glass upon which the Underwriter's Standard was based . . . the standard today by which all others are judged. Available in hexagonal or Misco wire mesh in types for clear vision or diffusion, wherever quality glass is sold.


Hammered Misco Wire Glass

Smooth Rough Misco Wire Glass

Polished Misco Wire

Send today for free literature. Address Dept. 11.

MISSISSIPPI Glass COMPANY

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WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRE GLASS

"Complete Control" solves another coffee-break problem!

The coffee-break is a problem in any size office or plant! A Rudd-Melikian dispenser is the answer. It's enjoyed by employees—helps keep them at the job. Conveniently and dependably serves Kwik-Kafé coffee—100% pure, fresh-frozen. Check with your local Kwik-Kafé dealer or write direct to us for complete details.

RUDD-MELIKIAN, INC. Kwik Kafe
Holborn, Pa.

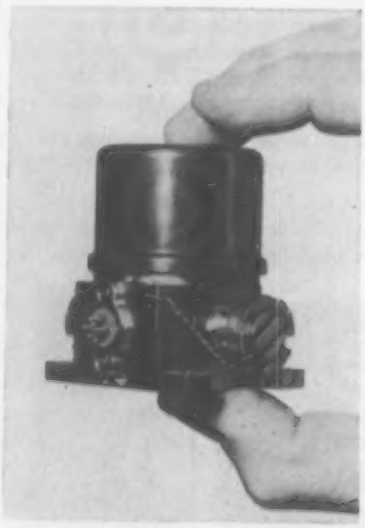
Gentlemen:
Please send me Booklet FM-10, explaining how to control the coffee-break with R-M dispensers.

Name.....
Firm.....
Street.....
City.....Zone....State.....

FACTORY / EQUIPMENT NEWS
Begins on page 160

For more about these products, circle item numbers on Reader Service card next to back page.

120—Distribution Transformers, oil-filled, feature core wound of special grain-oriented steel. Results in units of lower weight and higher efficiency. Easy to install; deliver greater capacity. Tank is corrosion-resistant. Through 167 kva. *Marcus Transformer Co.*



121—Servo Valves, electrically actuated, high-response, hydraulic, can serve a wide range of applications. Available for 500-3000 psi. systems. Controlled maximum output flows are 0-9 gpm., with a time constant of 1½ milliseconds from input differential current to output flow. *Bendix Aviation Corp.*

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Always Better
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PORTABLE FLUE GAS ANALYZER
COMPLETE CO_2 READING TAKES ONLY 20 SECONDS
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Complete facts on how to SAVE FUEL DOLLARS and maintenance man hours!
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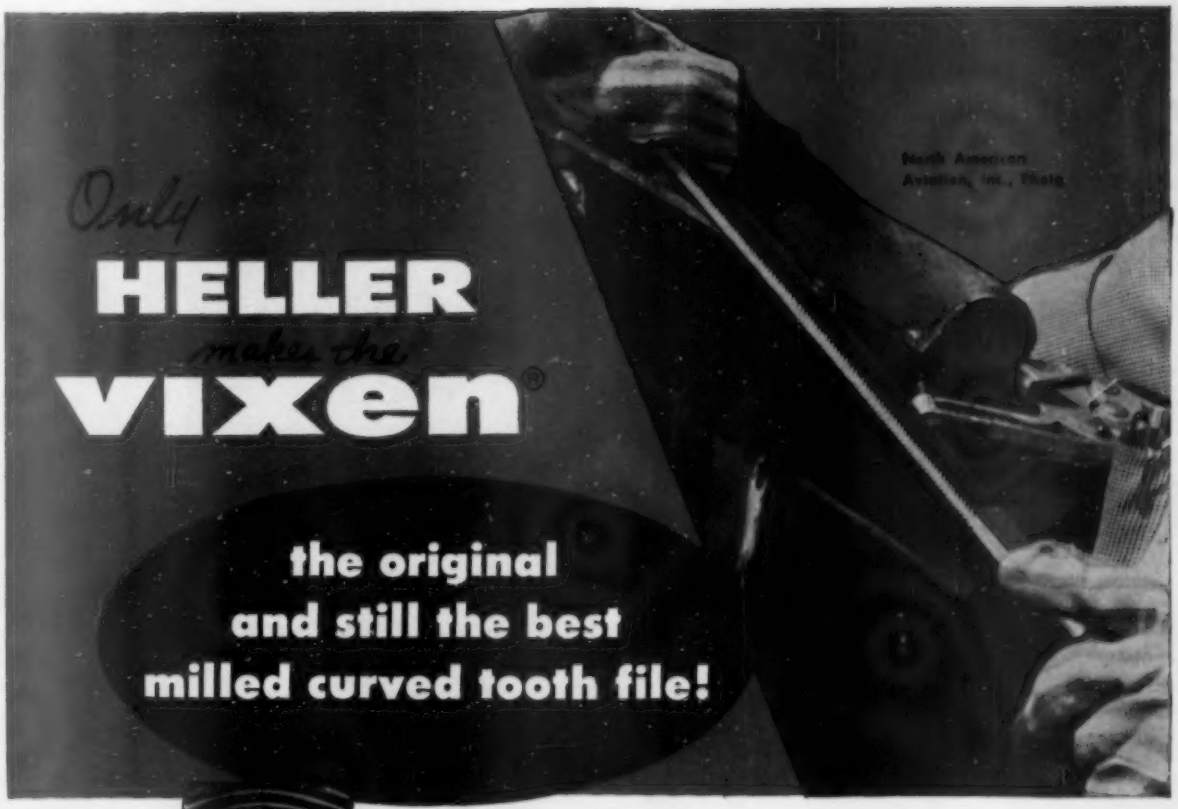
Sworn to and subscribed before me this 15th day of September, 1955.

[SEAL] ELVA G. MASLIN
(My commission expires March 30, 1956)



VIXEN files bite deep, cut fast, clear themselves readily and leave a smooth, even finish . . . work efficiently straight ahead or at an angle. Only Heller makes Vixen, both flexible and rigid tang file. They are still the most efficient and versatile metal finishing files.

IDENTIFY VIXEN FLEXIBLE BY THE WHITE ENVELOPE — VIXEN RIGID BY THE WHITE TANG

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YOUR HELLER DISTRIBUTOR CAN SUPPLY ALL YOUR FILE NEEDS

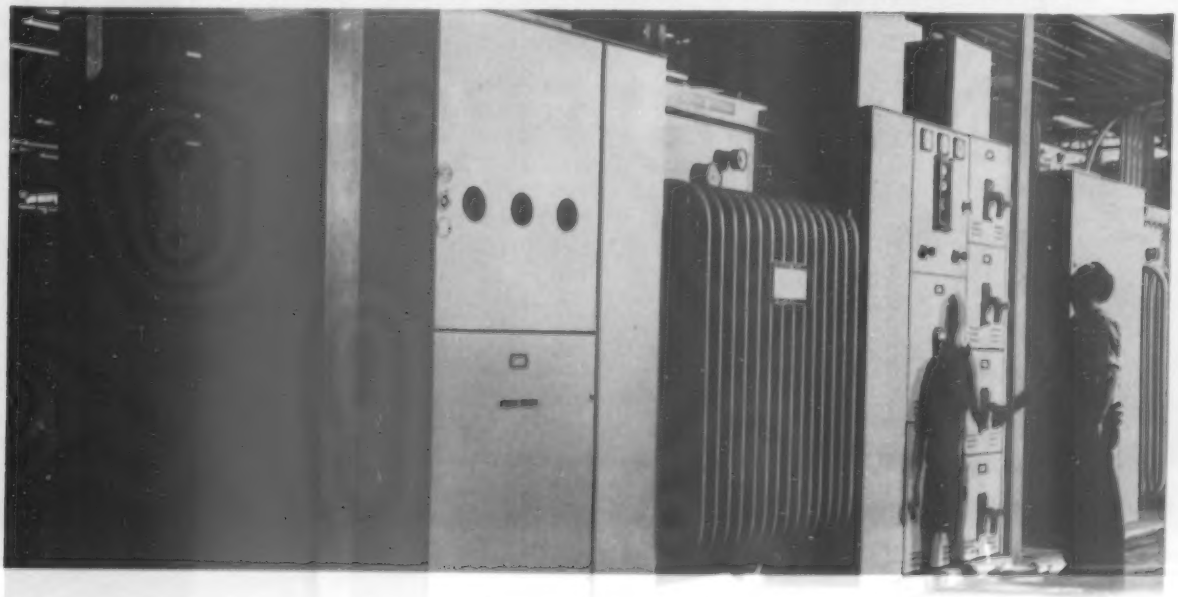
1 INDIVIDUAL AIR CIRCUIT BREAKERS provide the best protection for control or switching. Particularly suitable for motor control, they can't be "single-phased." Both drawout switchgear and individual breakers have racking device to simplify removal. Ask for Bulletin GEA-5915.

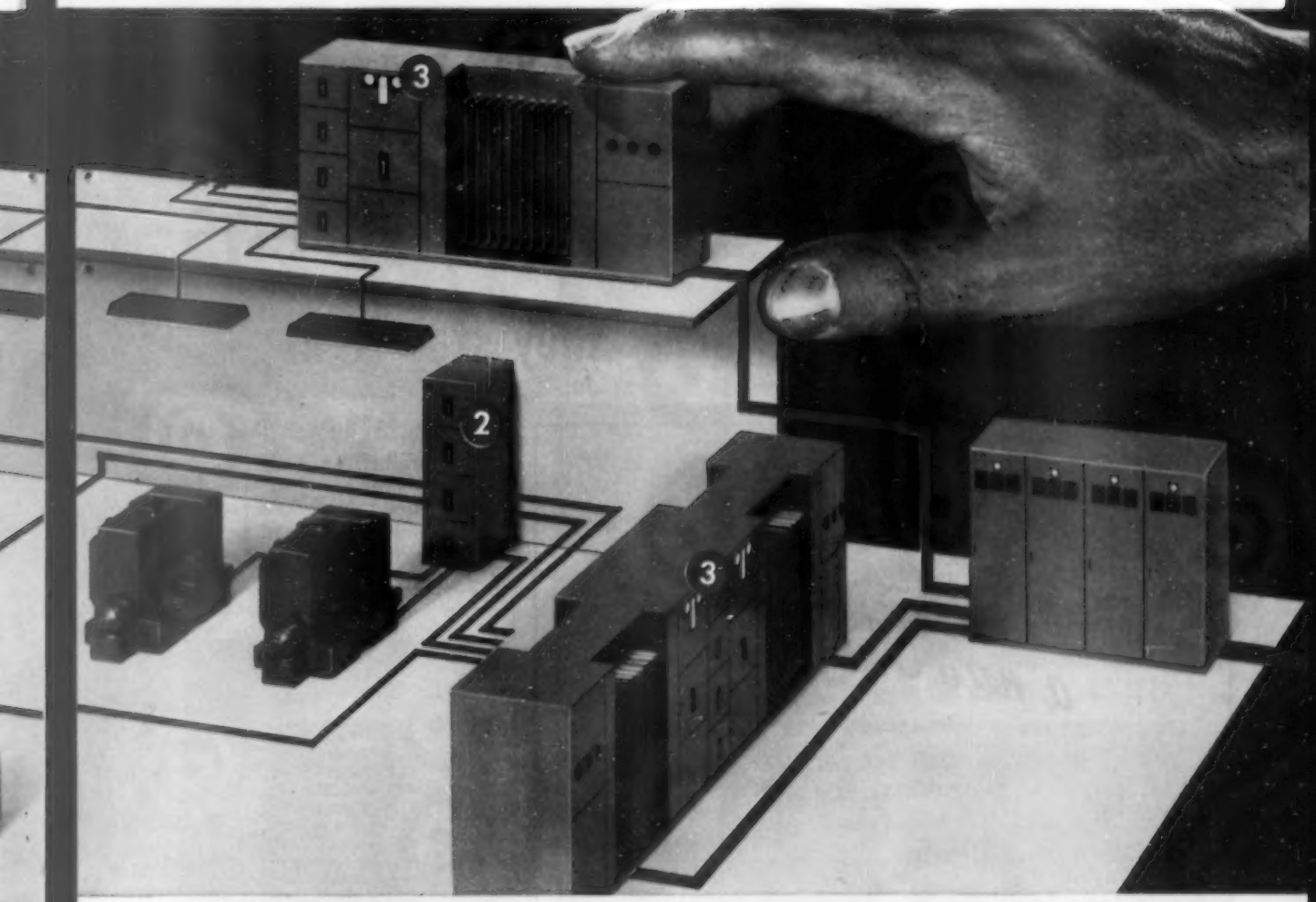
2 DRAWOUT SWITCHGEAR provides a convenient and economical way to locate a number of breakers in one out-of-the-way spot. This conserves valuable floor space and centralizes control. ***These entire equipments*** have been design tested up to maximum short-circuit ratings. Bulletin GEA-5916 gives details.

CAN YOU AFFORD A POWER FAILURE AT ANY POINT IN YOUR PLANT? G-E low-voltage switchgear—individual breakers **(1)** drawout switchgear **(2)** and load-center substations **(3)**—is designed to provide maximum protection up to full interrupting rating. This ability is backed up by DESIGN TESTING OF COMPLETE EQUIPMENTS IN THE SWITCHGEAR DEVELOPMENT LAB.

Now...more protection for less cost

3 LOAD-CENTER SUBSTATIONS bring power close to load for most economical distribution. Air circuit breakers are properly co-ordinated with transformer capacity to give optimum protection. For details ask for Bulletin GEA-3592.





at all these vital points...

YOU CAN'T AFFORD ANYTHING LESS THAN THE BEST WITH THE COST OF SWITCHGEAR REDUCED UP TO 33% BY THE INCREASE IN G-E AIR CIRCUIT BREAKER INTERRUPTING RATINGS

THE COST OF POWER DISTRIBUTION SYSTEM PROTECTION IS DOWN—if you are building or modernizing, you can get maximum protection with the right switchgear at about the same price you would have paid for equipment *barely adequate.* You can't afford to let another day go by without being positive that you have complete protection at every vital point in your electrical system. If you have a power system over ten years old, check it now for possible increased short-circuit capacities. Don't risk even a partial power failure when modernizing is so economical.

HERE'S HOW YOU CAN SAVE up to 33% with the recent increase in G-E air circuit breaker interrupting ratings. These increases—25 to 50% for low-voltage applications—permit the use of smaller, and less expensive, breakers at many points in your system . . . in load-center unit substations, drawout switchgear and individually mounted breakers.

CHECK THE PRICE on G-E low-voltage switchgear for your system. You'll be surprised at how favorably it compares with prices on equipment that doesn't offer the same reliability of operation, ease of installation and maintenance, and high degree of safety for personnel.

FOR COMPLETE INFORMATION contact your General Electric Apparatus Sales Representative or write to General Electric Company, Schenectady 5, N. Y. 523-3

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New High-Torque Unbrako self-locking socket set screws

set them, forget them—they stay tight

Up to 40% higher tightening torque—a new Unbrako feature

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

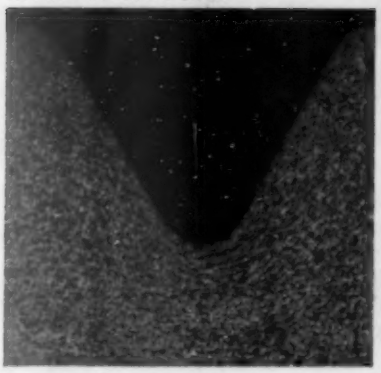
All UNBRAKOS can withstand higher tightening torques than ordinary set screws. For example, the recommended torque for a ¼" UNBRAKO is 87 inch-pounds —40% greater than that recommended for an ordinary set screw.

Research has proved that the tighter you seat a set screw the better it works. We went to work to design a socket set screw that could be tightened tighter than ever before without damaging the screw.

We formed a deeper socket. We put a radius in the socket corners. We developed fully formed threads. We established new methods of heat treatment in atmosphere-controlled furnaces. It took almost 6 years' research and development, but the new High-Torque UNBRAKO incorporates all of these improvements. And it retains the self-locking knurled cup point that keeps an UNBRAKO tight up to 48 times as long as a plain cup point set screw, regardless of the size of the point or the cup.

MOTOR FACTS ON INDUSTRY'S

UNBRAKO SET SCREW



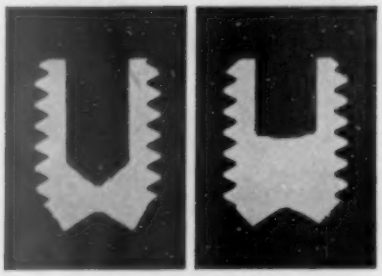
We fully form the threads—make the whole screw stronger. The metal is compressed into the closely knit grain structure that you see in this illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. The UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Screws with cut or ground threads lose thread form at root diameter.

UNBRAKO SET SCREW

We put a radius in the socket corners—eliminate the sharp corners where cracks start. This distributes the stresses developed when tightening torques are applied. Ordinary socket screws have sharp corners which often crack when tightened even at lower recommended torques.

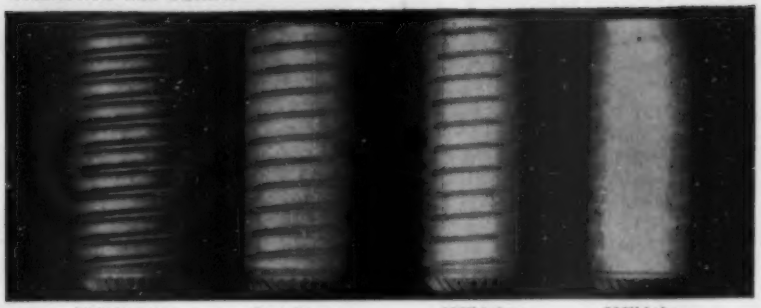
UNBRAKO SET SCREW

ORDINARY SET SCREW

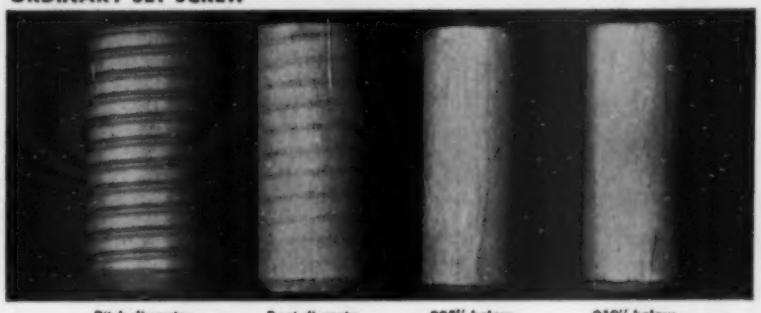


We form a deeper socket—give you more purchase with the wrench. Since more wrench can be put into the UNBRAKO socket, you can set the screw much tighter. And you won't ream the socket or round the corners of the wrench.

UNBRAKO SET SCREW

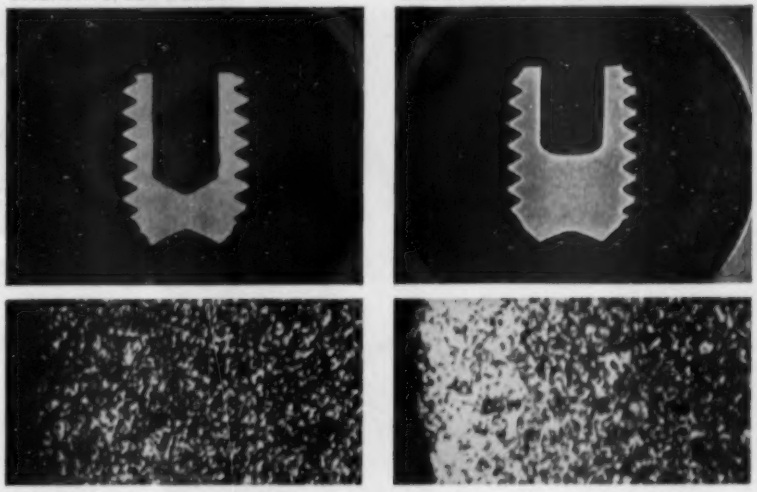


ORDINARY SET SCREW



UNBRAKO SET SCREW

ORDINARY SET SCREW



We heat treat an UNBRAKO properly. It's a ticklish job to heat treat a socket set screw. If you don't do it just right, you get decarburization. And decarb plays havoc with a screw. Put a wrench in the socket and you ream it. Run the screw into a tapped hole and you strip its threads. Try to seat the screw and its point shears off. These photos show the good and the bad. The UNBRAKO is clean. Its grain structure is uniform. There is no decarburization—the ordinary screw is suffering from an overdose of it, socket walls, threads and point are full of the telltale white spots.

You can't buy a better set screw than an UNBRAKO. See your authorized industrial distributor today. Or write STANDARD PRESSED STEEL CO., Jenkintown 11, Pa.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION sps JENKINTOWN, PENNSYLVANIA

MOTOR FACTS ON INDUSTRY'S
MOST PREFERRED "POWER PACKAGE"

Electrical System Fact—Only the new Life-Line "A" motor gives you the unsurpassed corrosion-resistant protection of exclusive new Bondar, Bondite and Mylar* insulations.

*Du Pont Registered Trade-Mark

THE SNAKE TAPE IDEA

FACT:

The new Life-Line A is the most corrosion-resistant motor on the market

The corrosive action of chemicals takes a heavy toll on conventional motors. The new Westinghouse Life-Line® "A" motor offers more protection against corrosive atmospheres than any other motor you can buy. How?

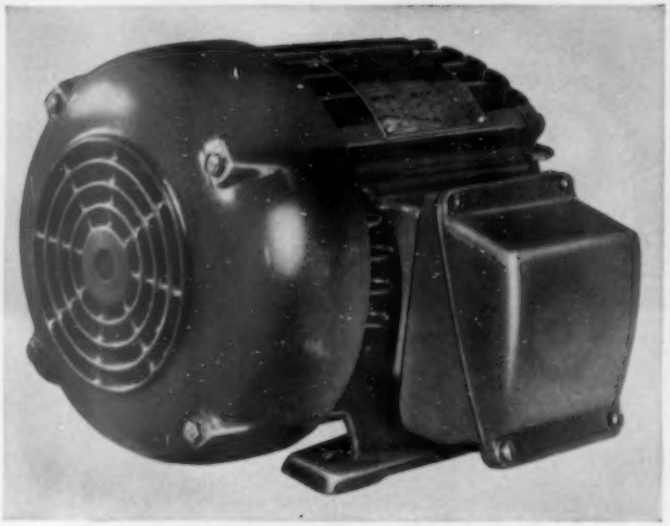
Because the combined improvements in insulation, housing and bearing design give unsurpassed protection against any contamination. It takes the right combination of such improvements in *all three systems*—electrical, mechanical and lubrication—to make the Life-Line "A" industry's most preferred power package.

Get all the facts by calling your Westinghouse sales engineer . . . *The Man With The Facts.*

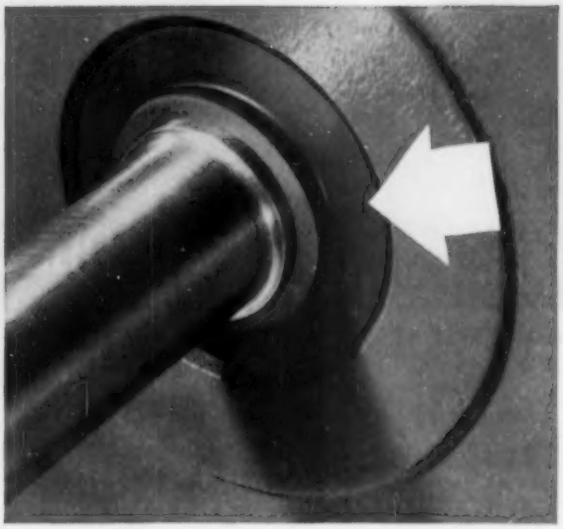
J-21881

YOU CAN BE SURE . . . IF IT'S

Westinghouse

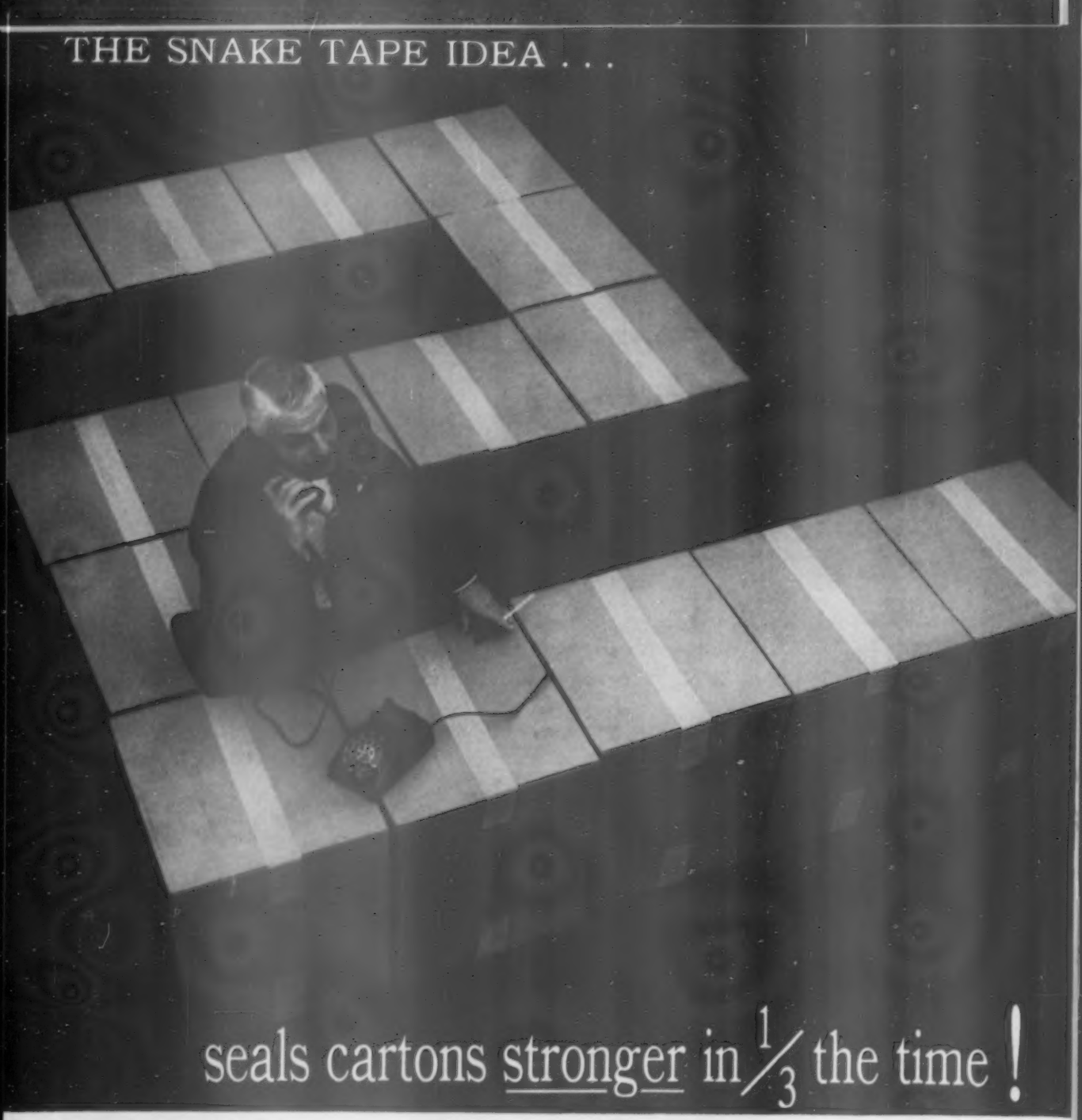


Mechanical System Fact—New cast-iron frames and brackets utilize the finest grained castings with uniformly thick wall sections precisely fitted and sealed. Molded glass plastic cooling fans on totally-enclosed types are chemically inert.



Lubrication System Fact—The new pre-lubricated Life-Line "A" bearing features a "4-way seal"—*two* seals on each side. Totally-enclosed types have additional neoprene flinger which assures bearing protection in any corrosive application.

THE SNAKE TAPE IDEA . . .



seals cartons stronger in 1/3 the time !

RULE 41 APPROVED: center-seam sealing with reinforced Snake Tape now is approved for rail shipment because it . . .

Ever tried a FREE roll of Snake Tape in your own shipping room?

You will find how easy it is to cut sealing costs today, now that Rule 41 U.F.C. recognizes the merits of using reinforced gummed tape. Snake Tape will cut your labor by two-thirds . . . you apply *two* strips, not six. And cartons are sealed so strong that you will eliminate damage claims!

Snake Tape is reinforced with RAYON (it *absorbs* shock just as rayon-reinforced auto tires absorb road shock). Other features: water-resistance, choice of six widths and choice of several ink colors for advertising your trade-mark or name on Snake Tape.

For that **FREE** sample write: ANGIER CORPORATION, Framingham 1, Mass.

Production goes on in the plant while

GUSTIN gb BACON SNAP*ON goes on the pipe....

This new and better way to insulate pipe saves valuable production time. Maintenance work or new installations can be completed faster. The photograph shows how a large manufacturer took full advantage of the one piece sections that were snapped on the overhead piping quickly, while work went on without fuss or muss in the plant below.

Ease of installation is just one reason why you should use Snap*On. The thermal efficiency of this new covering is the highest found in any pipe insulation, and because it is made of fine glass fibers it is tough and resilient. There is no breakage and virtually no mess to clean up when the job is done. It does not shrink, so the costly, time consuming job of pointing up opened joints is eliminated.

Your company is in the best of company when you use Snap*On, for a list of Snap*On users reads like "Who's Who in Industry". So don't put it off—put Snap*On on the very next time you insulate chilled or heated piping where temperatures do not exceed 350° F. The first step is to write for samples and our new brochure that contains complete technical data. Write today.

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238 W. 10th ST., KANSAS CITY, MO.

FACTORY | LABOR RELATIONS NEWS

By PAUL A. KING, Attorney, Bigelow-Sanford Carpet Company, Inc., Member, New York Bar

When Does Holiday Start and End?

When does a holiday begin? When does it end? Arbitrator Clair Duff says it runs from midnight to midnight. Why was it important to find this out?

Good Friday was a paid holiday at the plant of the Pittsburgh Commercial Heat Treating Company. Those who worked on holidays would get double time. Time and a half was paid for overtime.

The last shift before Good Friday (it ended at midnight) ran over. That is, some employees had to work 9 hours into Good Friday. Pittsburgh paid them double time for the 9 hours—the holiday rate. But the unaffiliated UE claimed this plus the overtime rate. The union argued that the work day is the 24-hour period beginning with the shift starting time. Any work in this period over 8 hours was overtime.

The arbitrator found no definition of workday in the contract. Therefore, said he, it runs from midnight to midnight. Up to midnight Thursday these employees worked 8 hours. Any work after that time was Good Friday work entitling them to double time holiday pay—and that's all.

No Second Guessing for NLRB

This recent decision indicates that the National Labor Relations Board will not always upset an arbitration award in an unfair practice case—even though the Board would have ruled otherwise, had it heard the case to begin with (*Steelbieg Manufacturing Company*). However, there must have been a fair and regular hearing. This appears to mean: Both parties agreed to the proceedings; all the facts were explored; the employees' rights under the NLRA were not ignored; and the decision of the arbitrator is not repugnant to the purpose of the act.

In the Steelbieg case, four strikers were not reinstated because of their conduct while in a picket line. The union, the company, and the four strikers agreed to put the case before a three-man panel of arbitrators. The panel opposed reinstatement of the four—so they filed a complaint with the NLRB charging a violation of the act. The trial examiner ruled in their favor, but the Board—as already indicated—threw the case out.

Unions Look at Cash Receipts

Under some pension plans and other benefit plans—or union contracts including pension provisions — the union is permitted to examine books, records and other data deemed necessary to make sure the company is living up to its obligations. One company, with a provision of this kind, had no objections to exposing its Cash Disbursements book to union scrutiny—but drew a line as to its Cash Receipts book.

There was no specific language in the contract supporting the employer's view, said the arbitrator who was asked to rule on this case. Because it seemed to him that inability to examine all books might prevent the union from discovering improper accounting, the arbitrator ordered the employer to show its Cash Receipts Book. *(Pleaters, Stitchers and Embroiderers Award)*

Union Unfair to Management

Picket line signs complaining about low wages is not uncommon. But did you see the recent news item reporting a five-man picket line in front of Newark's Center Market protesting against high wages?

The signs were hoisted by five contractors, all members of the Associated Building Contractors of Essex County, New Jersey, who were registering unhappiness with the Center's new contract with the AFL Carpenters Union granting a 15¢ per hour wage boost and another 15¢ a year from now.

Know About These Pension Trends?

Seen, but not heard about much, are the five-year contracts of the Big-Four rubber companies covering fringe benefits and pensions. The pension provisions of the four—Goodyear, Goodrich, Firestone, and U. S. Rubber—according to the Prentice-Hall Pension and Profit-Sharing Report (No. 11)— 'tell you to look for the following trends in union negotiated plans: more emphasis on protecting pensions against inflation; higher pension minimums; liberal early retirement and disability retirement provisions; demands that pension increases be passed on to workers already retired; shorter eligibility periods to qualify for benefits; and vesting."

Vacation Pay an Earned Right

There still are die-hard employers who hang on to an apparently ancient industrial adage that vacations for employees are granted solely for rest in anticipation of another year's service. Few, if any, arbitrators go along with this view today. Most say that vacation pay is earned as you work. It's part of an employee's pay—and whether or not he remains on after vacation, he is still entitled to vacation pay—if he meets all the conditions for earning this pay. Where do arbitrators get this idea? They say it's "the apparent thinking of management and labor and of industry generally."

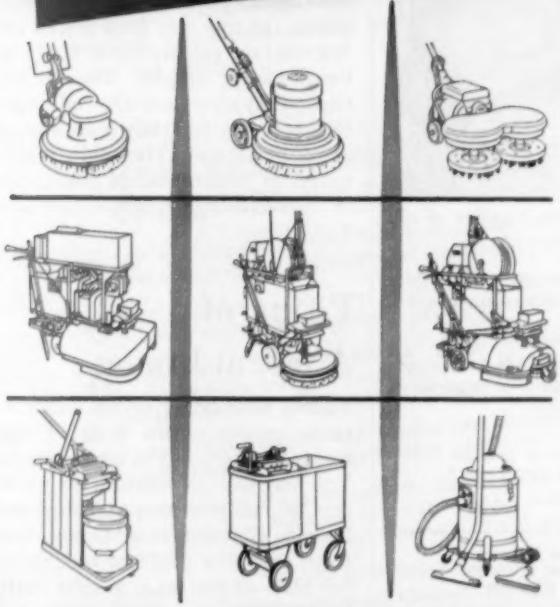
Does it make any difference if an employee quits voluntarily—that is,

Keep your floor-maintenance men happy . . .

with *Job-Fitted* EQUIPMENT!

Choose from the COMPLETE *Finnell Line*

More than a score of models and sizes permits selection of the equipment that's exactly right for your job!



However much a maintenance man may want to do a good job, and at the same time show savings in labor costs, he's *stymied* if the machine is too small, or too large, or is otherwise unsuited to the job. Different floors and areas call for different care and equipment. That's why *Finnell makes more than a score of floor-maintenance machines.* From this complete line, it is possible to choose equipment that is correct in size as well as model . . . that provides the maximum brush coverage consistent with the area and arrangement of the floors.

Finnell makes *Conventional Polishing-Scrubbing Machines* in both concentrated and divided-weight types, each in a full range of sizes . . . a *Dry-Scrubber,* with self-sharpening brushes, for cleaning grease-caked floors . . . *Combination Scrubber-Vac Machines* for small, vast, and intermediate operations, including gasoline as well as electric models . . . *Mop Trucks* . . . *Vacuum Cleaners* for wet and dry pick-up, including a model with By-Pass Motor. In addition, *Finnell* makes a full line of fast-acting *Cleansers* for machine-scrubbing . . . *Sealers* and *Waxes* of every requisite type . . . *Steel-Wool Pads,* and other accessories — *everything for floor care!*

In keeping with the *Finnell* policy of rendering an individualized service, *Finnell maintains a nation-wide staff of floor specialists and engineers. There's a Finnell man near you* to help solve your particular floor-maintenance problems . . . to train your operators in the proper use of *Finnell Job-Fitted Equipment and Supplies* . . . and to make periodic check-ups. For consultation, demonstration, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2511 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

Begins on page 246

instead of being terminated by the employer? According to an arbitration award involving the New York Pressing Machine Company, Paterson, N. J., he still gets his vacation pay—prorated for the period in which he worked. Vacation pay is an earned right—not a privilege.

Meeting to Protest Supervisor Is OK

Some employees were unhappy with the new broom wielded by a recently appointed supervisor. His discipline was too stern. One lunch hour they met as a group to discuss ways and means of handling him. When management got wind of the meeting, the employees concerned were fired. The National Labor Relations Board ordered their reinstatement reminding the employer that this was a protected activity under the Taft-Hartley law.

But suppose an employee wishes to remove his supervisor out of spite. And there's no basis for his unhappiness. In this case (and it's an actual one) the employee was fired and the discharge upheld. The distinction? Employees are allowed to get together only for their own mutual aid or protection. They are not protected in actions taken invidiously to subvert management. *(Hearst Publishing)*

Firing of Accident-Prones

Putting your finger on an accident-prone person is one thing. Firing him is another—if you have a union. You may have to convince the union that he really is an accident-prone. Perhaps convince an arbitrator, too. Even then you may not be able to fire him—if you have a safer berth he could fill.

In any event, if the union objects to his discharge and you go to arbitration, the advice of arbitrator Paul Prasow may come in handy. In an arbitration case involving Northrop Aircraft, Inc., he indicated his pref-

Universal Winding Co. Cuts Tool Costs With McCaskey Tool Crib Control

Since installing McCaskey Tool Controls, the Universal Winding Company of Cranston, R. I. reports a big improvement in shop efficiency and major reductions in operating costs.

Mr. J. W. Egan, Tool Supervisor, says McCaskey Methods have been used since 1952 in the two main tool cribs for both their textile twisting and winding machines and for their electrical coil winding machines. He high-spots the benefits:

"McCaskey Tool Crib Control has not only tied responsibility for specific tools to each employee but has enabled us to get a monthly report on worn and damaged tools which are charged to each department. Also, tool crib operation has been speeded up now that the location of all tools on the floor can be readily determined."

Mr. Egan adds: "By disclosing dead and infrequently used tools, as well as any excessive inventory of active items, McCaskey has enabled us to cut our overall tool inventory and save considerable money."

Comparable operating savings can easily be yours. McCaskey has Tool and Gage Controls and specific control systems to offer money-saving benefits regardless of your products, or the size of your plant.

Find out how McCaskey eliminates such costly operating expenses as tool loss and theft, high breakage unbalanced inventories, and production delays. Mail coupon today for free booklet. No obligation, of course.

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PRODUCTION • INVENTORY • TOOLS
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Manufacturers of Business Machines Cash Registers, Business and Industrial Systems, Electronic Equipment, Electri-Cars.
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Please send me your new booklet: "How Tool Costs Were Cut 12 Ways in 20 Plants."

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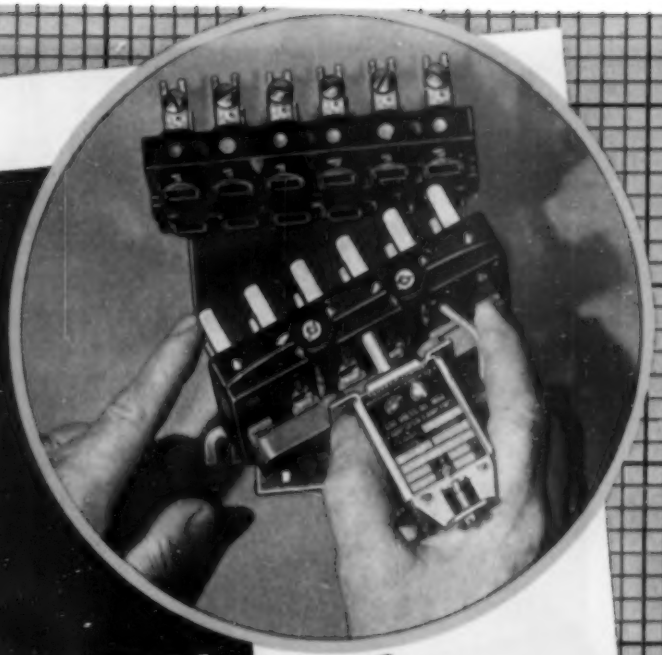
Now... PLUG-IN RELAY FOR INDUSTRIAL SERVICE!



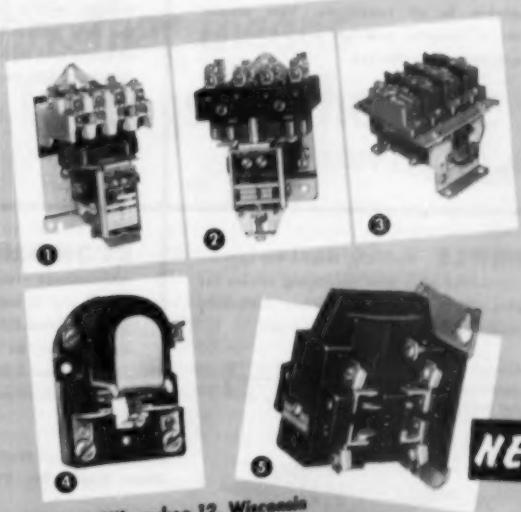
Qwik Change

• A screwdriver and five seconds are all you need to remove this new **PLUG-IN** relay for normal inspection, maintenance or replacement! That's big news in these days of "pushbutton" operations when even a few minutes of down-time can mean thousands of production dollars down the drain.

Square D Field Engineers have sensed this ever-increasing problem in their contacts with machine tool builders and industrial plants throughout the country. Square D design engineers have followed through with this, the first **plug-in** relay built specifically for machine tool use. Another example of design leadership!

HERE ARE OTHER MEMBERS OF SQUARE D's RELAY TEAM

1. **TYPE B** (15 Amperes, 600 Volts) Heavy-duty construction with hardened parts for severe machine tool service
2. **TYPE A** (10 Amperes, 600 Volts) Designed for general-purpose applications involving normal operations
3. **TYPE P** (Rated 10 Amperes, 600 Volts) Totally-enclosed contacts make this type especially suitable for operations in dusty or linty locations
4. **TYPE C** Used as auxiliary devices for controlling small, single phase motors or other light loads
5. **TYPE D** (Rated 10 Amperes, 600 Volts) This new and most compact of all Square D relays is ideal for general-purpose applications involving very limited space



Write for Bulletin 8501
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ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

INSUL-8-BAR

ENCLOSED CONDUCTOR SYSTEMS

FOR LOW COST
CRANE AND MONORAIL
SAFETY ELECTRIFICATION

FLEXIBLE Special engineering is never required. Standard parts are readily adaptable to all conditions, from simple curves to complex switches. Insul-8-Bar can be engineered on the job.

VERSATILE Conductors (see sketches) can be placed as close as 1¼" centers, in any desired arrangement. This is the only system that meets all requirements of crane and monorail electrification. Capacities 50 to 500 amperes.

SIMPLE Basically, Insul-8-Bar consists of conductor bars with insulating covers (as illustrated), and trolley collectors. Simplicity is coupled with rugged construction.

ECONOMICAL Installation and maintenance costs are exceptionally low. Initial cost is well below comparable safety systems. Insul-8-Bar can be applied to existing systems, or installed as a new system. Specify Insul-8-Bar for all crane and monorail electrification needs.

INSUL 8 CORP

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Other Insul-8 Systems include:
Bare Bar Systems
Side Contact Systems

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Begins on page 246

erence for a review of the employee's medical record by an independent expert in the field of industrial psychology. He deprecated use of his own judgment as an arbitrator. But no such testimony having been introduced in the case, he had no alternative but to rely on the judgment of the company doctor. Since there was no clear proof that the employer's judgment was wrong, he upheld the discharge.

What Unions Are Getting

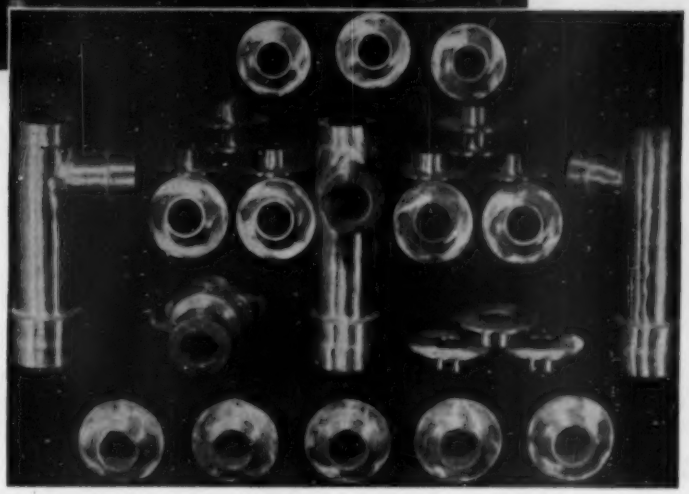
Unions are asking for—and getting—more money. A recent wage survey run by the Bureau of National Affairs shows that "about 55% of the wage agreements (not including fringes) surveyed. . . . since the auto and steel settlements have given pay raises of seven cents an hour or more. Prior to June 1, adjustments above the six-cent figure had been running at about 39%. This greater incidence of fatter increases in the agreements examined since June 1 results in large measure from a jump in the proportion of seven-to-nine unit adjustments."

The following table included in the survey shows the percentage of settlements in each wage category before and after June 1.

	Before June 1	After June 1
No increase	10%	5%
1¢ through 3¢	7	3
4 " 6	44	37
7 " 7	17	30
10 " 12	14	16
13 " 15	4	5
16 " 18	1	2
19 and over	3	2

How to Prevent Dips Into Welfare Funds

The extreme interest that employers once took in their employee's welfare was called paternalism. The pendulum has swung back—and some employers take little interest in their employees—when they belong to a union. It seems that conscientious employers must take an interest if this kind of thing is to be



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32 pages of valuable and complete data on stainless castings: analyses, properties, technical data on handling and heat treatment, typical applications, how to order, etc.

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Every stainless casting produced by our Buffalo Foundry carries the familiar "AL Star" trademark, cast into the steel. That means it's *Allegheny Metal,* the time-tested stainless steel—a pioneer that has successfully answered thousands of difficult corrosion and heat resisting problems.

It not only means experience in stainless casting applications, but in maintained high quality, too. The A-L Buffalo Foundry is a pioneer in both the vertical-centrifugal and static methods of casting stainless steel. You can depend upon Allegheny Metal Stainless Castings to be strong, clean-surfaced, sound-structured and easy-machining . . . fully in accord with the service conditions and with your requirements for delivery.

Let our stainless foundry specialists quote on *your* problem jobs—any shape casting or any size, up to thousands of pounds. ● *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*

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Now! Your plant can have clean, sanitary concrete floors, for Granitex seals concrete floors and produces a dustproof, oilproof surface that can be easily swept or mopped. No germ-laden dust can hide away. Floors treated with Granitex are morale-builders, too. Employees just naturally appreciate working on floors that are dustfree and attractive.

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Granitex contains Devran (epoxy resin), . . . new miracle ingredient that resists moisture, acids, alkali . . . and even shakes off rough, rugged traffic wear. Devran (epoxy resin) has been performance-proven in some of Truscon's most famous protective coatings . . . in all types of industry, under the most rigorous conditions.

DISCOVER NOW, WITH NO OBLIGATION, HOW EASILY AND ECONOMICALLY YOU CAN HAVE CLEAN, SANITARY CONCRETE FLOORS . . . SEND COUPON TODAY!

A ball of pure Devran is more resilient than a golf ball . . . will bounce higher when dropped on a concrete floor. Devran enables Granitex to "bounce back" after being subjected to harsh treatment, both chemical and physical.

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RUSH DETAILS ON GRANITEX TO:

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FACTORY / LABOR RELATIONS NEWS

Begins on page 246

prevented: A Senate subcommittee reports that employers kicked in 7½¢ per hour to a welfare fund run by Edward Gallagher, President of Local 52 of the Painters, Cleaners and Caulkers "without benefit of any written agreement." The money said the subcommittee, was spent without accounting. Large amounts were paid for "items bearing no relationship to welfare benefits—such as Cadillacs, trips to Florida, payments to athletic clubs and taverns, and many cash withdrawals." The subcommittee concluded: Trustees and employers abdicated responsibility. They'd better recapture it!

How to Adjust for Minimum Wage Boosts

Beginning with March 1956, the minimum wage under the Wage-Hour law will be $1 an hour instead of the current 75 cents The minimum wage boost applies to all employees engaged in interstate commerce, the production of goods for such commerce, or in any closely related process or occupation essential to such production. Of course, there are exceptions.

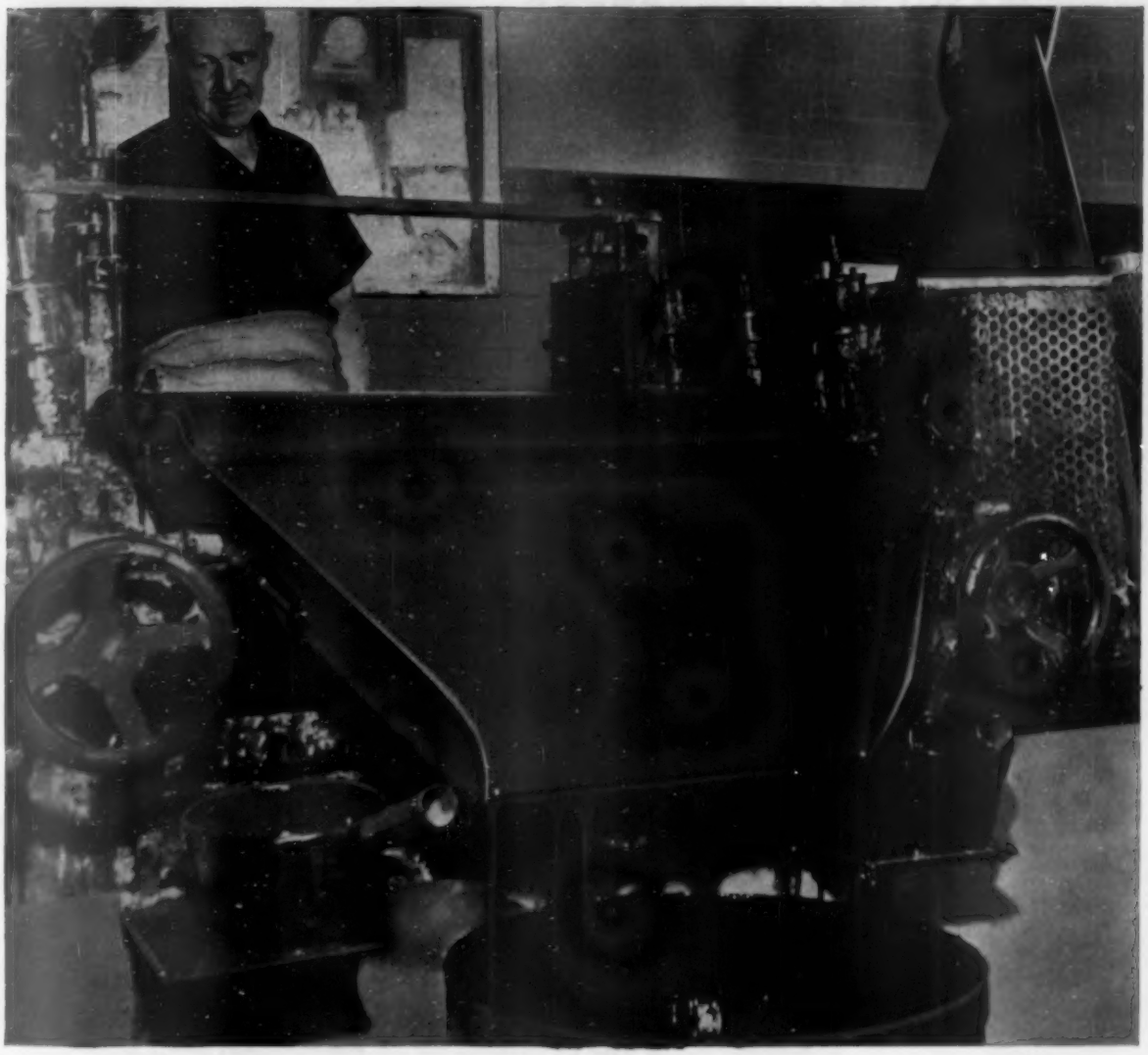
Employers who now pay less than the $1 per hour minimum may satisfy the law by upping the hourly wage of such employees. But this may solve only part of the problem. Such an increase at the lower end of the wage ladder will upset wage differentials in the pay rate schedule, thus causing unrest among employees. To avoid this, other rates up the line should be examined and perhaps increased.

BRIEF BUT IMPORTANT

Veterans' rights and the night shift. No sympathy for this veteran. Before induction he was on the day shift. When he returned he was put on the night shift. A U.S. Court of Appeals failed to heed his complaint of loss of social life and inconvenience of night hours when it ruled that here he was given a job of like status. (*Boone*)

Turn the page

FIRE HAZARD FOILED!



VINYL RESIN PLASTICIZERS AND VOLATILE SOLVENTS!

Wherever highly combustible materials are used — as in this "dope room" at the Athol Manufacturing Company's Massachusetts plant, a potential fire hazard is *always* present!

Athol executives were keenly aware of the importance of *dependable, automatic* fire protection to provide the maximum in safety measures. So Athol called on Kidde — leaders in the field of fire extinguishing equipment.

Kidde engineers analyzed the various hazards, installed a 20-cylinder CO_2 extinguishing system which would automatically snuff out fire the instant it showed itself. In addition, pressure-operated trips were incorporated in the system to shut doors and windows, shut off fans and motors and to sound an alarm.

See to it that every fire hazard in *your* plant — machinery, flammable liquids, electrical equipment — gets the *best* in fire protection. Contact Kidde today!

Kidde (K Kidde)

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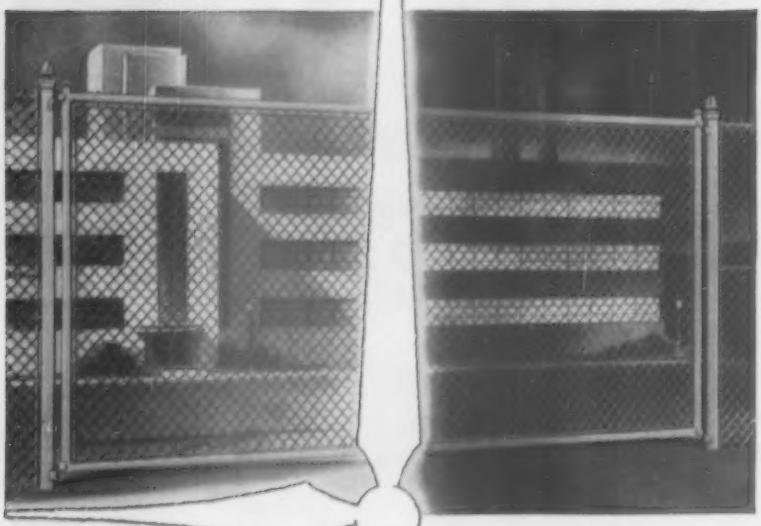
DAY & NIGHT



Protection for your plant

Today's modern plants require 24-hour protection against trespassers, vandals and troublemakers. Anchor Fence not only gives you low-cost day and night protection, but at the same time helps control traffic in and out of your grounds, provides safe outdoor storage, and gives your plant and grounds that orderly, "well-kept" look.

Insist on *Genuine* Anchor Fence

Look for the famous orange-and-black nameplate that tells you you're getting genuine Anchor Fence with the deep rooted anchors that keep it in line, erect, year after year, in all kinds of weather and soil conditions. Needs no painting, thanks to zinc coating applied after weaving, not before. For more information about Anchor Fence, call your local Anchor office or write: ANCHOR POST PRODUCTS, INC., *Industrial Fence Division*, 6620 Eastern Avenue, Baltimore 24, Md.

Anchor Fence®

Division of ANCHOR POST PRODUCTS, Inc.

Plants in Baltimore, Md.; Houston, Texas; Los Angeles, Calif.
Branches and warehouses in all principal cities

FACTORY / LABOR RELATIONS NEWS

Begins on page 246

Approved union deductions. In California, it is now legal for employers to deduct from employee wages payments to pension and health and welfare plans authorized by collective bargaining. (*L.1955, C.496*)

Union as unfair employer. In August, the NLRB kicked out an unfair-practice case charged by the AFL Employees International against the AFL Teamsters Union in Portland. Taft-Hartley doesn't cover unions as employers, said the Board. They're non-profit-making. But the Employees union disagrees and is now filing suit in a U.S. Court of Appeals.

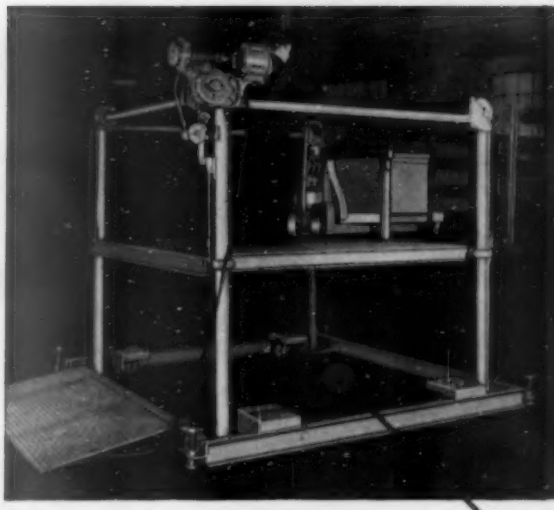
Good booklet. "It's good business to know your men" is not only sound personnel advice, but happens to be the title of a brief guide for employers prepared by the National Institute of Mental Health. Shows how supervisors can improve communications with their men. Available for 10 cents from the Superintendent of Documents, Washington 25, D. C. Ask for Public Health Publication 379.

You Be the Arbitrator

Begins on page 120

THE AWARD: The arbitrator said the cited clause referred to changes in "physical work elements," usually brought about by new materials, design, or machinery. The only change here was in the method of *paying*, not in the method of manufacture. Consequently piece rates could not be changed without negotiation.

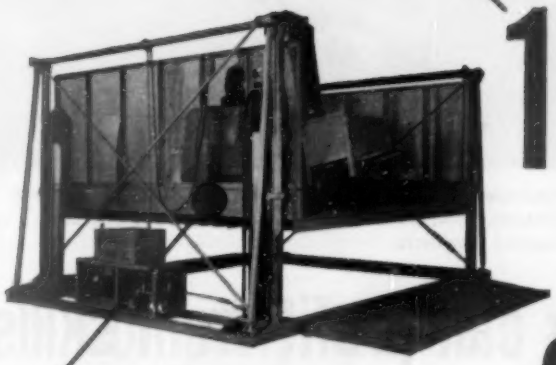
CAUTION: The award in this case is not an indication of how other arbitrators might rule in apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.



3 Ways

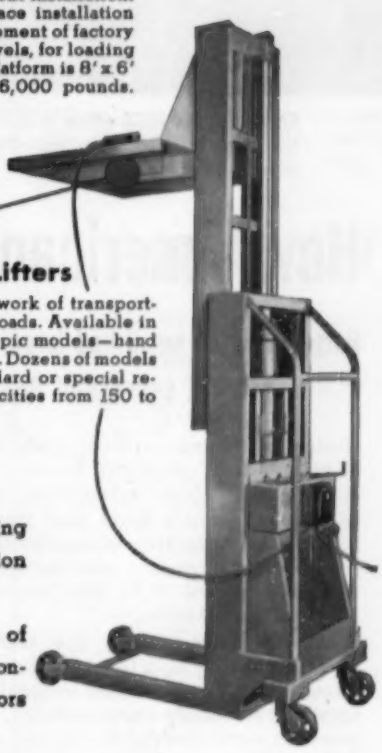
to Make Materials-Handling Easier, Faster and SAFER with

COLSON LIFTING EQUIPMENT



1 The *COLSON* Leveler

Can be installed anywhere, inside or out, as a portable or permanent installation. No expensive sub-surface installation required. Ideal for movement of factory trucks between floor levels, for loading trucks or freight cars. Platform is 8' x 6' 6", lift is 5', capacity 6,000 pounds.



2 The "Four Poster"

The big brother of the Leveler, this heavy duty machine requires no expensive pit or sub-surface work of any kind. Five standard models, with lifts from 10' to 17', have capacities to 12,000 pounds. Platforms in standard widths and lengths from 5' to 12'. Consult us for "special" lifts and sizes beyond these stated capacities.

3 *COLSON* Lifters

Make quick easy work of transporting and stacking loads. Available in single and telescopic models—hand or power operated. Dozens of models available for standard or special requirements. Capacities from 150 to 3,000 pounds.

COLSON manufactures lifting equipment to meet almost any materials-handling need—from 150 to 12,000 pounds. All are designed for easy, simple operation and maximum safety—built *up* to a standard, not *down* to a price.

Whatever your requirements—it will pay you to consult COLSON, maker of the nation's most varied line of materials-handling equipment. Write us or consult your local phone book (under "Trucks—Industrial"; "Casters" or "Elevators—Portable") for the COLSON office near you.

Write today for free booklet "COLSON Lifting Equipment"

Casters • Hand Trucks • Lift-Jack Systems • Hydraulic, Electric and Mechanical Power Lifts and Transports

THE COLSON® CORPORATION

Elyria, Ohio

CAN THESE SKILLS OF SMALL BUSINESS HELP YOU?

SMALL BUSINESS offers design and development of prototypes as one of its major contributions to nation's economy. At Pattern Products Manufacturing Company, Detroit, C. A. Warner, Sales Engineering Director (left), reviews new product design with R. J. Bennett, Chief Production Engineer.

How American industry can profit from skills

Partnership of small and large business in defense work pays off in expanded talents and facilities at successful Detroit company—now ready to serve other manufacturers

During the Korean conflict, when the Pattern Products Manufacturing Company of Detroit accepted its first General Electric defense subcontract, it had only eighteen people working in a single small plant. It was one of the 17,000 subcontractors and supplies that teamed with G.E. in defense work—and a good example of small businesses that made up 80% of the firms helping with General Electric defense production.

Small business meets the test. Pattern Products was first asked by G.E. to manufacture a special screw jack assembly. It wasn't an easy assignment. General Electric furnished the highly complex design, but the part required precision workmanship. And it was needed fast.

Putting its operation on a 24-hour basis, the company came through. And when G.E.'s Aeronautic and Ordnance Systems operation received the first shipment on time, the part was found to meet all of G.E.'s exacting requirements.

Success leads to expansion. Following this initial test, Pattern Products received other G-E orders. To meet this demand—and that of other manufacturers attracted by its expanding reputation—the company bought and re-equipped two *new* plants out of reinvested capital, hired 109 new people. Their gross sales jumped almost 450% from 1950 to '54. They now stand at an impressive $2,078,000.

Defense production today still accounts for most of the Pattern Products Company's output. But although G.E.'s A&OS was its first major customer—and still accounts for 35% of its business—most orders now come from a wide range of aircraft and associated industries which use the small company's skills in various applications differing from G.E.'s.

G-E help for small business is *typified* by Pattern Products' success. This small company, with skills and facilities developed through working with G.E., is now a more valuable member of America's production team . . . one more example of the partnership between large and small business which keeps America healthy in peace and formidable in war. 649-3

Progress Is Our Most Important Product

GENERAL ELECTRIC

G-E RADAR SYSTEM part requires machining of close tolerances by subcontractor. On-the-spot conferences at Pattern Products bring together skills of men trained in defense orders.

PRECISION TECHNIQUES, such as this boring of aircraft hydraulic system body from aluminum forged billet, helped build company's reputation, increased its value to industry.

one company learned as a G-E subcontractor

ON-TIME DELIVERY, important for both defense and non-defense orders at Pattern Products, is assured by close control of schedules on board shown here.

COMPANY'S PRESIDENT Harold E. Hurkett credits G.E. with key role in helping firm's growth. Sales climbed 450% from 1950 to 1954.

EXPANDED FACILITIES— now housed in three modern plants, like one on left—make Pattern Products even more valuable as a defense subcontractor, help increase its contribution to America's peacetime industry.

CAN SMALL BUSINESSES HELP YOU?

Thousands of small businesses, like Pattern Products Manufacturing Co., have furnished General Electric with practically every kind of skill and services as defense subcontractors and suppliers. Many of these companies have available production capacity, created in large part by the reduction of defense orders since the Korean War peak. This means that they may be able to apply their skills to help you with your production.

If you have a manufacturing problem or have work available for subcontracting, please write us on your letterhead stating in as much detail as possible the type of services or skills you require. We will be glad to suggest several small businesses who have done similar work for us and may be able to help you. Write to C. W. Bryant, Manufacturing Services Division, General Electric Co., 570 Lexington Ave., New York 22, New York.

a revolutionary
advance in lift truck design

PANORAMIC VISIBILITY

where and when
it counts most...

NEW HYSTER "MONOMAST" LIFT TRUCK

YC-40, UC-30
(4,000 and 3,000-lb. capacity)

GETS MORE WORK DONE because operator SEES BETTER, works faster, more confidently, and in greater safety.

No other lift truck today offers this all-around panoramic visibility! Operator does not have to crane his neck to see where fork tips are going...and in backing up, functional body design permits unobstructed view of more floor behind the truck.

Exclusive "MONOMAST" panoramic visibility and faster lifting speeds make possible faster approaches, more accurate placing of loads, less package damage ...far more tons moved per hour.

Unique "MONOMAST" construction, consisting of two telescoping box-shaped sections, provides unexcelled strength, rigidity and safety—plus full protection to the hoist cylinder.

Hyster standard job-attachments, including hydraulic, can be used with the "MONOMAST".

SEE THE DIFFERENCE. Ask your Hyster Dealer for full information. He is listed in the yellow section of your phone book, under "Trucks—Industrial", or write direct.

PATENTS PENDING

MATERIALS HANDLING TRUCKS from 1,000 to 30,000 lb. capacity

HYSTER COMPANY

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FOUR FACTORIES: Portland, Oregon; Danville, Illinois; Peoria, Illinois; Nijmegen, The Netherlands

FREE

Shipping Container Requirements
All corrugating materials must measure at least .009" thick and weigh at least 26 lbs. per 1000 sq. ft.
Maximum Gross Weight (Box and Contents) 90 Lbs.
Max. Size (Inside Length plus Width plus Depth) 90 Inches
Minimum Bursting Strength (Mullen Test) 275 Lbs./sq. in.
Minimum Combined Weight of Facings of Corrugated Fibreboard and of Component Plies (Exclusive of Adhesive) of Solid Fibreboard.
Double-Faced (Single-Wall) Corrugated Boxes 138 Lbs.
Double-Wall Corrugated Boxes 110 Lbs.
Solid Fibre Boxes 237 Lbs.
per 1000 sq. ft.
YOU'RE LIVING NEXT DOOR TO THE EXPERT
Gair Container Plants and Sales Offices are strategically located throughout the United States. Check your telephone directory for the one nearest you.

SHIPPING CONTAINER SLIDE RULE

Purchasing, Traffic, Shipping Execs — this is for you! Packaging engineers, materials-handling experts and production men also may be interested.

Here's the handiest answer to many of the questions you're asked about shipping container requirements. Packed into 3 x 6¼" size is the heart of Rule 41, Uniform Freight Classification, governing corrugated and solid fibre board packages.

Gross weight, weight of facings, size and bursting strength of containers are correlated in seconds by the slide rule action. Export packagers will be interested in the Government Specifications for Weatherproof Containers on the reverse side of this handy timesaver.

Gair offers this Shipping Container Slide Rule free. It's just one more way we can help make your job easier. Simply fill out and return this coupon. SC.5.46

YOU'RE LIVING NEXT DOOR TO THE EXPERT

GAIR CONTAINER PLANTS: Atlanta, Ga. • Cambridge, Mass. • Cleveland, Ohio • Holyoke, Mass. • Jackson, Miss. • Los Angeles, Cal. • Martinsville, Va. • New Orleans, La. • No. Tonawanda, N.Y. • Philadelphia, Pa. • Plymouth, Mich. • Portland, Conn. • Richmond, Va. • Syracuse, N. Y. • Teterboro, N. J.

SINCE 1864

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Gentlemen:

I'd like to have your Shipping Container Slide Rule.
Please send it to:

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FIRM_____ POSITION_____

ADDRESS_____

CITY_____ ZONE____ STATE____

Others in my firm who also might want one are:

NAME_____ POSITION_____

NAME_____ POSITION_____

Service..... there are 42 Black & Decker factory service branches strategically located throughout North America. There's one "next door" to you—staffed by experts to give fast, satisfying service, genuine replacement parts!
We don't buy motors -we build them!
Every B&D motor is built specifically for each tool and the job it does so well! Compact, lightweight, universal type motors built to supply ample torque at most efficient spindle speeds . . . the kind of results you can expect from every B&D Tool!

Black & Decker electric drills mean low initial cost- more convenience, less noise—and they're

POWER-BUILT TO LAST!

The power, speed and accuracy of Black & Decker Drills mean faster, better production, lower costs! The Black & Decker-originated pistol-grip and trigger-switch, the lightweight, *balanced power* GUARANTEE reduced operator fatigue! And unexcelled workmanship throughout makes your Black & Decker Drills thoroughly dependable, inexpensive, "low maintenance" production workhorses.

31 models assure you of the widest selection of drills, from ¼" to 1¼" . . . for intermittent or continuous heavy-duty production or maintenance jobs! Call your Black & Decker distributor or write for a free catalog to: THE BLACK & DECKER MFG. Co., Dept. 1311, Towson 4, Md.

Drills • Sanders • Polishers • Grinders • Valve Refacers • Vibro-Centric Drivers & Kits • Shears • Vacuum Cleaners • Black & Decker's complete line of portable electric tools—all power-built to make your jobs faster, better, easier!

Leading Distributors Everywhere Sell

Black & Decker®

PORTABLE ELECTRIC TOOLS

"Used many makes of turbines... PREFERS COPPUS"

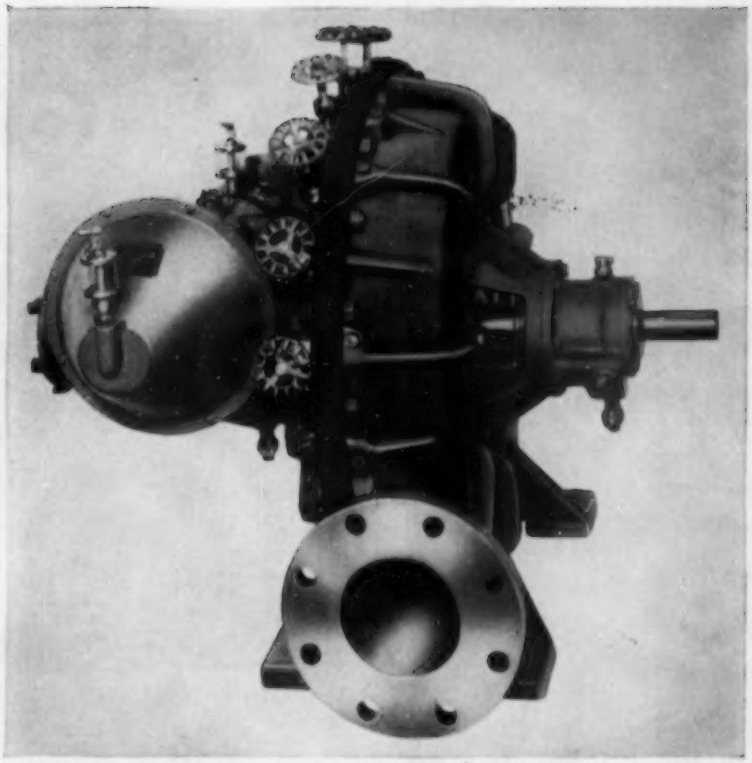
If you want to know about turbine performance, ask an *operator*. He *knows*. And, in the words of one of them:

> "I have had occasion in the past to operate many makes of turbines. The plant in which I am now employed is almost entirely Coppus equipped on our auxiliary equipment. I find your turbines most satisfactory and would like to congratulate you on your design."

Whether you use a Coppus with a regular wheel or wide bucket "L" type you get these *proven* features:

- Turbines rated close to your hp requirements from 150 hp down to fractional. No need to buy a bigger, costlier turbine than your conditions call for.
- A larger number of steam nozzles, controlled individually by manually operated valves.
- Exclusive pilot operated excess speed safety trip supplementing constant speed governor.
- Replaceable cartridge type bearing housings.
- Optional carbon ring packing glands.
- Coppus Steam Turbines ranging from 150 hp down to fractional in 6 frame sizes, *make turbine dollars go farther*. Send for Bulletin 135 on Coppus Turbine.

COPPUS ENGINEERING CORPORATION
111 Park Avenue, Worcester 2, Mass.
Sales offices in THOMAS' REGISTER



This is the reliable Coppus Turbine furnished with either a regular wheel or wide bucket "L" type wheel.

This wide bucket "L" type wheel is a new development for use where low water rate is essential.

This is the regular wheel used on Coppus Turbines which have been so highly satisfactory throughout industry.

COPPUS "BLUE RIBBON" TURBINES

Call the GARLAND MAN for experienced advice on industrial maintenance paints, roof or floor repairs. Garland's been solving paint, roof and floor problems since 1895.

Send us your special problem

THE
GARLAND
COMPANY
Cleveland 5, Ohio

FACTORY | EXECUTIVE HEALTH

By REX H. WILSON, M.D., Medical Director
The B. F. Goodrich Company, Akron

AUDIOMETRIC TESTS tells just how good your hearing really is.

How Much Do You Hear?

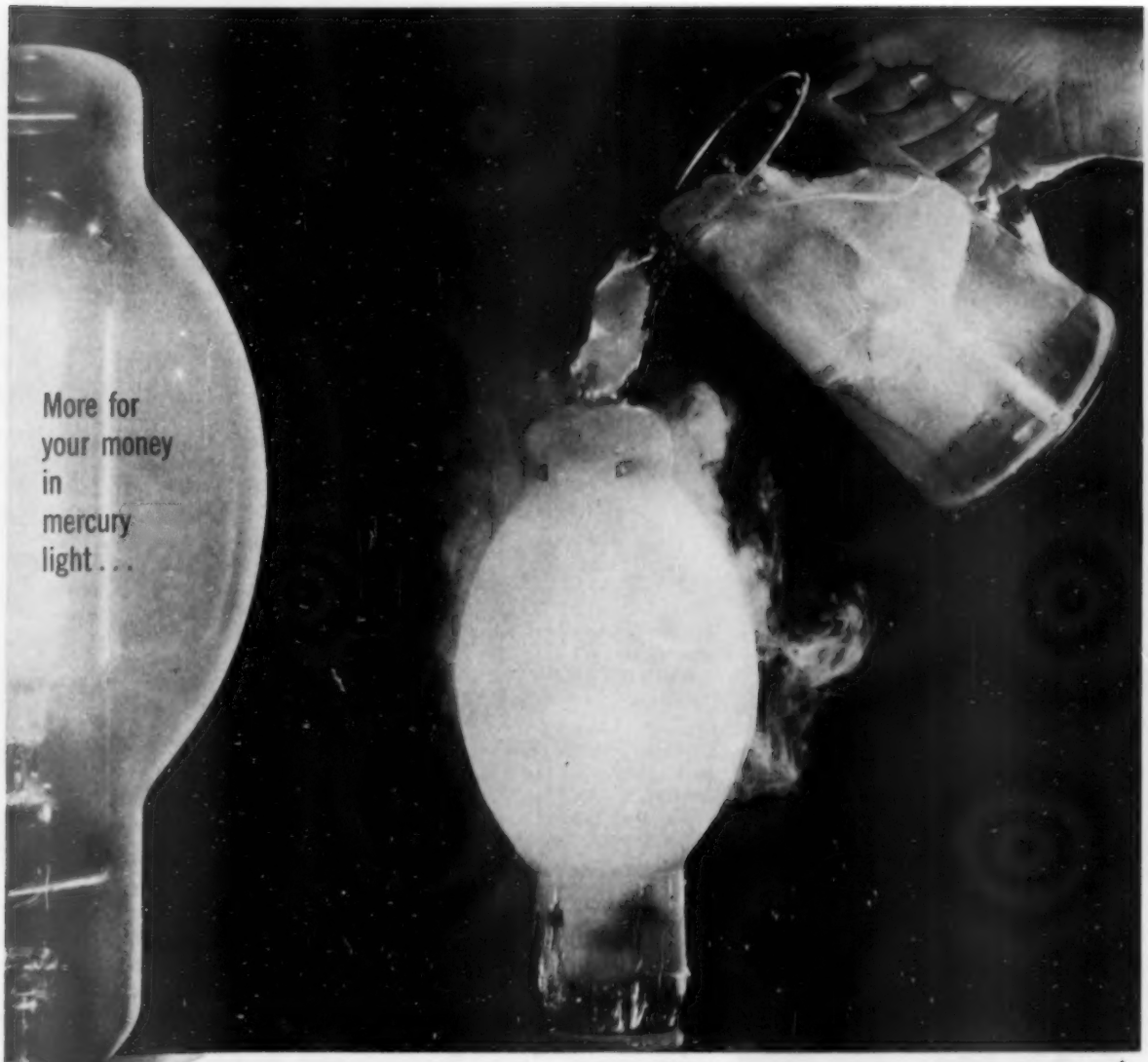
Whether it's much or little—if it's not 100%, find out how to correct the trouble—and do it quick.

RALPH'S was a typical success story. He started fresh out of engineering school as a foreman. Received promotion after promotion until he was pretty nearly top man in his plant. Not long ago he came to see me, complained of difficulty in hearing. When attending a meeting he couldn't hear all the conversation around the table. He was frantic — knew that adequate hearing was important for his position. An ear specialist took over—found that he had middle-ear deafness of a moderately severe degree. Probable cause — repeated infections of the middle ear. Fortunately this type of deafness can be helped by the use of a hearing aid. Thanks to this Ralph is still progressing in his company.

How we hear—Hearing depends upon proper functioning of a complicated, delicate mechanism that includes: external auditory canal, ear drum, eustachian tube connecting ear with throat, structures of internal ear, labyrinth that is body's balancing mechanism, and nerves that go from ear to brain.

How deafness comes—Commonest cause of deafness is advancing age. As you grow older you can expect some loss of hearing, particularly for high-pitched tones. Also there may be a ringing in your ears called tinnitus. But impairment of hearing at any age should be investigated. Frequently it's due to disease of the auditory nerve, which connects the ear with the hearing centers of the brain. And sometimes, the cause can't be found at all.

Deafness can be acquired from infections of the ear, nose and throat, or from general body infections. I have seen children who were deaf because of enlarged tonsils and adenoids. Meningitis, scarlet fever, typhoid fever, influenza, or measles may cause injury to the nerves or canals of the ear, and result in hear-



ANNOUNCING NEW WESTINGHOUSE WEATHER DUTY(TM) MERCURY LAMPS

Down again go your lighting costs as Westinghouse announces another basic improvement in high-intensity mercury lamps. It's the world's first line of *weather-resistant*, heavy-duty mercury lamps.

Made with hard, tough, thermally stable glass, new Westinghouse WEATHER DUTY Mercury Lamps can be burned outdoors unprotected in rain, snow or sleet with no risk of cracking. And they can be burned indoors in ventilated fixtures with no danger of shattering under water drops entering through the ventilating openings. Moreover, they are highly resistant to mechanical breakage and to the corrosive effect of industrial fumes.

Thus in any type of installation—indoor or outdoor—Westinghouse WEATHER DUTY Mercury Lamps save you money three new ways. First, by eliminating the need for protective shields and permitting the use of cheaper fixtures. Second, by doing away with costly shield maintenance. And third, by releasing the large amount of light wasted by dirty shields.

WEATHER DUTY Mercury Lamps are the latest example of how Westinghouse gives you "*more for your money in mercury light.*" Now available types E-H1-WD, J-H1-WD, A-H12-WD, C-H12-WD, A-H15-WD and B-H15-WD.

WESTINGHOUSE GUARANTEES the service life of all its widely used types of quartz mercury lamps. For full details call your Westinghouse Lamp Representative—or write Westinghouse Lamp Div., Dept. FM, Bloomfield, N. J.

YOU CAN BE SURE...IF IT'S Westinghouse

Begins on page 262

ing loss. Permanent deafness may begin abruptly on the fourth or fifth day of mumps.

It's interesting to note that overuse or hypersensitiveness to quinine and aspirin may cause a nerve deafness. Streptomycin, one of the newer miracle drugs, occasionally has a toxic effect on the auditory nerve causing ringing in the ears, loss of balance, and deafness. Fortunately this is usually relieved when drugs are stopped.

Industry's approach—Deafness is becoming a major problem for industry (see FACTORY, December 1953). It has been accepted that toxic exposure to lead, phosphorus, carbon monoxide, arsenic, mercury, and the analine dyes may cause hearing loss, loss of balance, or ringing in the ears. In many states hearing loss due to excessive noise is recognized as an occupational disease. Many industries, to protect themselves against unjust claims of loss of hearing, are accurately checking hearing of their employees, especially new ones. Noise reduction in the plant is another approach.

What you should do—You can easily distinguish between auditory milddle-ear deafness and nerve deafness by holding a watch at various distances from the ear. In middle-ear deafness the ticking may or may not be heard. But it *is* heard when placed in contact with the bone behind the ear. In nerve deafness it is not heard at all. An audiometer is needed to accurately check the amount of hearing in each ear.

Ringing in the ears is a symptom of ear disease in eight out of ten cases. Others — besides deafness — are roaring, rumbling, constant or throbbing high-pitched tones, and whistling.

Loss of hearing is a handicap that puts anyone at a disadvantage. But it need not happen to you. If you have any symptom of a hearing disorder, have it investigated immediately. Modern medicine in most cases is able to treat these disorders and diseases, thus prevent impairment of hearing. If you already have a hearing loss, a hearing aid will help to offset it.

Why settle for 50 years when you could have 100?

Want to move things up

For lifting or lowering — floor-to-floor — the INCLINEBELT

Continuous package conveying — a complete belt conveyor system or the Inclinebelt—complete, compact easy-to-install, electric-motor powered unit. High, continuous-line load capacity for any floor elevation. Available in belt widths of 8-12-14-18-24-30 and 36 inches.

down

For inclined or horizontal conveying — the UTILITY BELT-VEYOR

Conveys from floor-to-floor. Moves "packages" down, up or horizontally. Electric motor powered. Installs over existing stairways, or can be used as a portable Levelbelt conveyor. Four standard belt widths: 10-14-20 and 24 inch.

or horizontally?

For straight line or inclined conveying — assemble your own system or portable conveyor using HANDI-DRIVE pre-built units

These stock, pre-built conveyor units make it easy to assemble what you want in a conveyor. Converts existing gravity conveyor to power conveyor — quickly and at low cost. Can be installed as single portable unit or complete system.

Standard builds conveyors to speed any ONE or all THREE

Call your Standard representative listed in your classified phone book or send for illustrated Standard General Catalog describing all three units — address Dept. FM-11.

STANDARD CONVEYOR COMPANY

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GRAVITY & POWER **Conveyors**

ROLLER • SLAT • WHEEL
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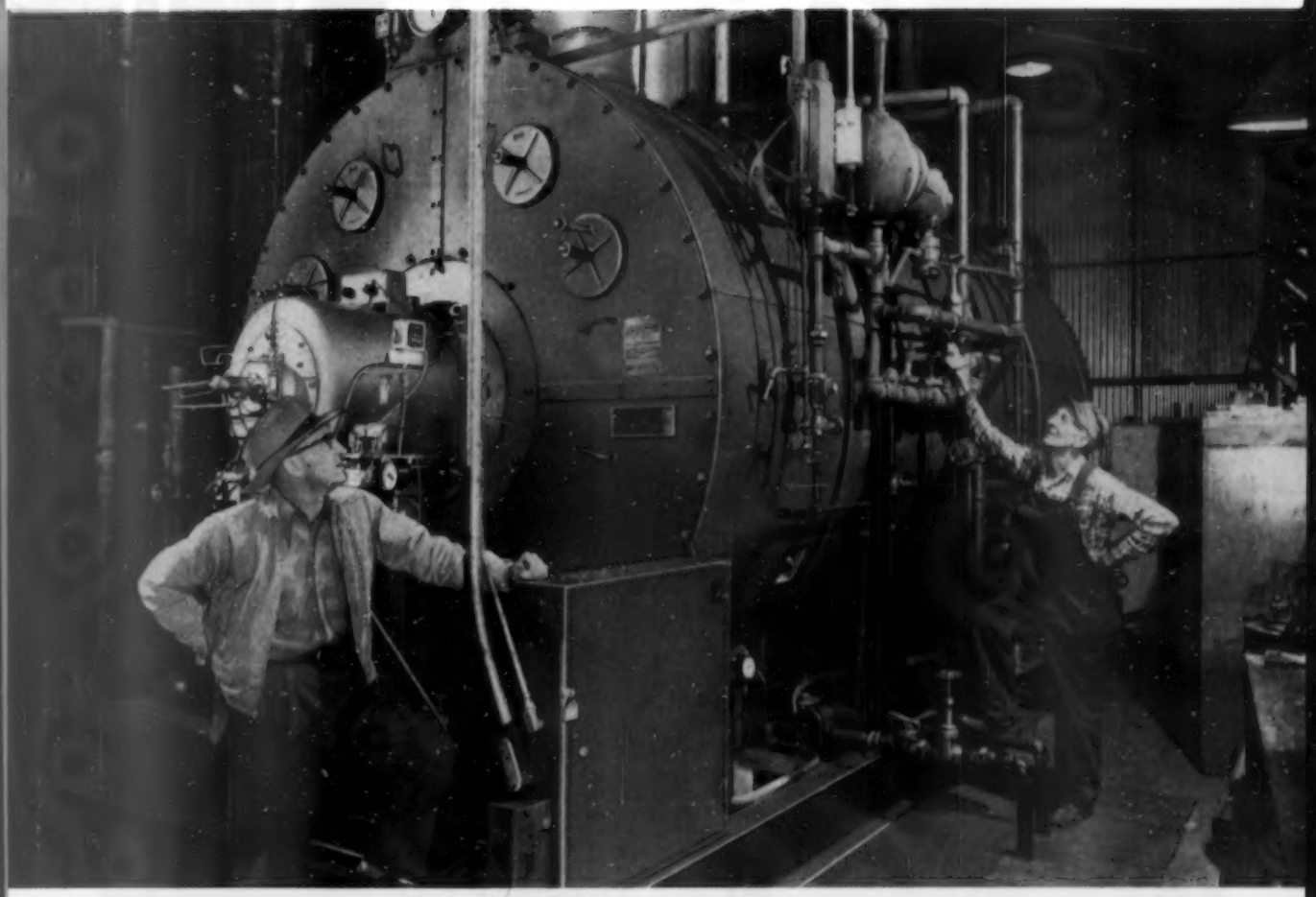
PNEUMATIC TUBE SYSTEMS



Why does ONE *Powermaster*® sell OTHERS in nearby plants?

You get MORE than Operating Efficiency with Powermaster

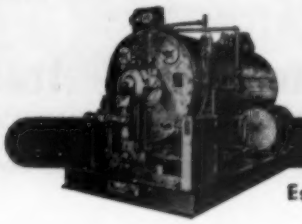
- ★ Low-cost, space-saving installation
- ★ Fast steaming
- ★ Instant response to load changes
- ★ Quick fuel change-overs
- ★ Clean, dry steam
- ★ Automatic operating and safety controls
- ★ High fuel economy at all loads
- ★ Clean, quiet operation
- ★ Smokeless combustion
- ★ One-source responsibility for complete unit
- ★ Nation-wide factory-trained service organization
- ★ Pay-As-You-SAVE Purchase Plan

This 500 HP *Powermaster* Packaged Automatic Boiler installed in a West Coast food processing plant has led to the purchase of four *Powermaster* units by other companies in the same area.

The reason for these extra sales is because *Powermaster* is solving two steam problems—more steam for processing, and more efficient off-season heating by means of modulating control of firing rate.

You can now purchase a completely factory-assembled and fire-tested *Powermaster* on the new Pay-As-You-SAVE Purchase Plan that helps you pay for your new boiler out of the savings it brings you.

Write for Bulletin 1220 or ask our representative to tell you how *Powermaster* can meet your requirements.



Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.

ORR & SEMBOWER, INC.

Established 1885 • Morgantown Road, Reading, Pa.

J-M 85% Magnesia is lightweight . . . easy for workmen to install half-sections on this 10" steam line. Insulation work at the Grace Chemical plant was performed by Young Sales Corporation of St. Louis. Engineering and construction was directed by Foster Wheeler Corporation of New York.

Your Btu's and dollars go further when you specify **Johns-Manville 85% Magnesia**

. . . the choice of insulation engineers at Grace Chemical's new Memphis plant

INDUSTRY'S LONG-TIME standard for temperatures to 600F is still your best insulation buy. For J-M 85% Magnesia provides high insulating value, easy application, long life, initial low cost and minimum maintenance. That's why insulation engineers consistently specify J-M 85% Magnesia for modern installations like Grace Chemical's new anhydrous ammonia-urea plant. That's why it will pay you to specify J-M 85% Magnesia for your new plant or modernization program.

To assure you maximum value from your insulation dollar, Johns-Manville gives you complete drawing-board-to-job-site service. You get expert recommendations by the world's most experienced insulation engineers . . . plus expert installation by authorized J-M Insulation Contractors. Write today for further information on J-M 85% Magnesia and Johns-Manville's unmatched facilities to solve your insulation problems. Address Johns-Manville Box 60, New York 16, N.Y. In Canada, Port Credit, Ontario.

J-M 85% Magnesia also comes in block form. Here you see it being applied to a vertical drum at a New Jersey petroleum refinery.

Johns-Manville *first-in* **INSULATION**

MATERIALS · ENGINEERING · APPLICATION

Coin Trick Proves RO-FLO COMPRESSOR Is Smooth Worker

Smooth Operation is Key to Savings

Everybody around the place knew the *Ro-Flo* compressor was a smooth operator. But just how smooth?

Someone suggested the old coin trick . . . balance a coin on it while it's running.

The next we knew the foreman was calling, "Come down and see for yourself." We went to the shop. And sure enough, there the penny was standing as still as you please.

What does that mean to you?

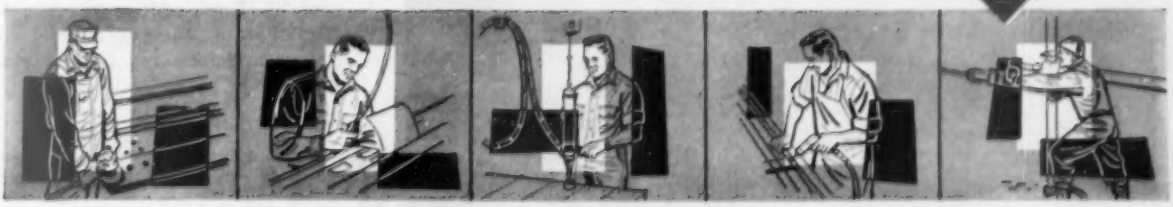
It means, here's a compressor that needs practically no foundation. And it means there's no wear and tear from vibration...less maintenance.

You get constant air supply with this machine, too. For this story: Call your nearby A-C office for complete information, or write Allis-Chalmers, Industrial Products Division, Milwaukee 1, Wisconsin.

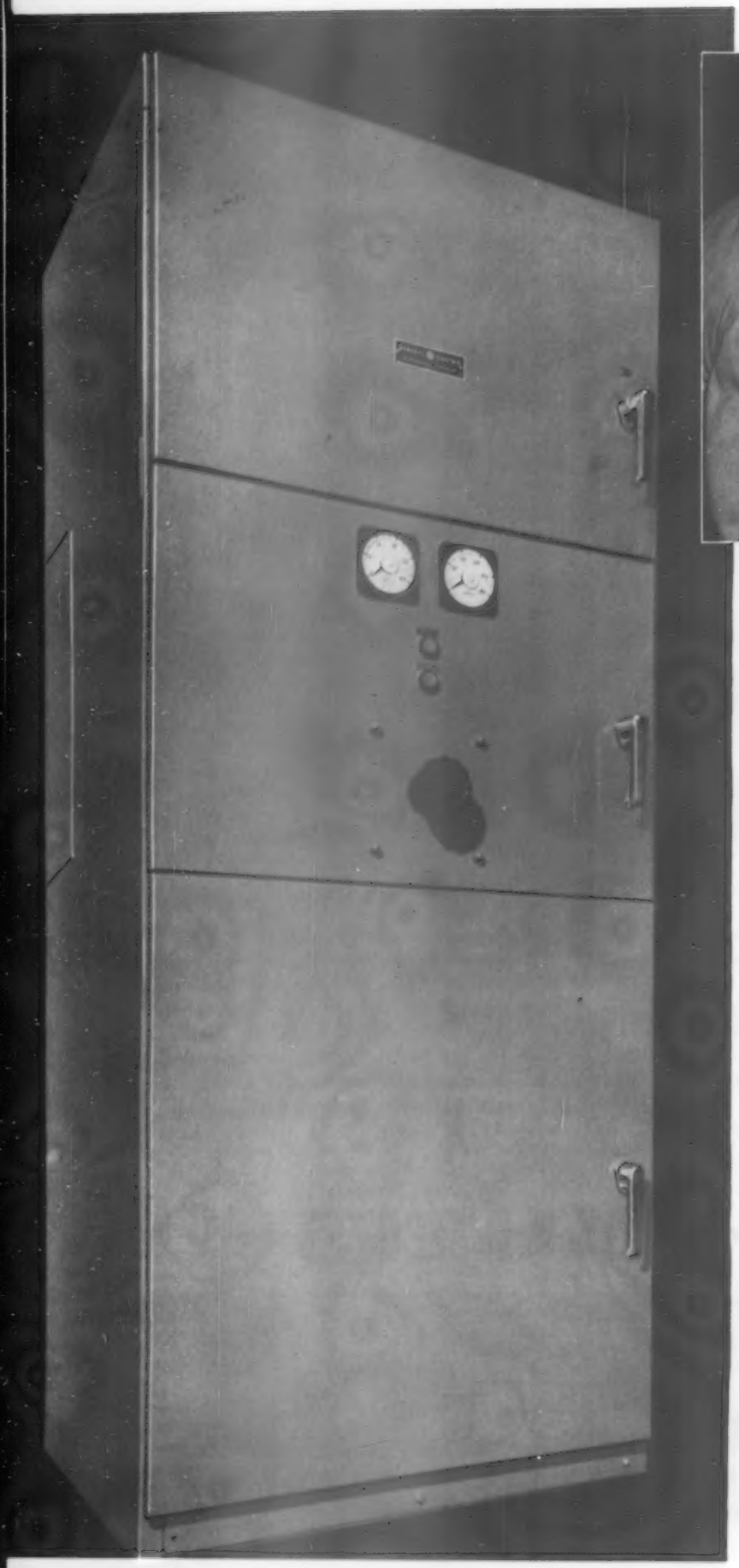
A-4716

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS



Ro-Flo compressors provide constant efficiency and air supply for air tools



3 CUSTOMERS STATE . . .

Space, Safety

Placed on the market in July of this year, General Electric's all-new Limitamp Control has received enthusiastic acceptance throughout industry.

1. NEW MOUNTING ARRANGEMENTS. Almost immediately, L. L. Hamig, of Ferris & Hamig, Consulting Engineers, found the exclusive front-connected feature of the new control solved a tough application problem. There is no need for a back aisle with the new equipment, so units may be mounted back-to-back, back-to-wall, or as free standing enclosures yielding great space savings.

2. 50% SMALLER. In another case, H. A. Weigand, of Ingersoll Rand Company specified this new fused starter in a compressor station for the Laclede Gas Company of St. Louis, Missouri. Mr. Weigand stated the new control's 50% floor space saving feature simpli-

50% smaller than previous models, all-new G-E Limitamp Control offers a gang-operated disconnect switch as standard equipment. See opposite page for space savings comparisons.

"The all front-connected feature of G.E.'s Limitamp Control gave me the versatile floor arrangement I needed to solve a tough application problem," said Mr. L. L. Hamig (extreme left) of Ferris & Hamig, Consulting Engineers, St. Louis, Mo. Seated are R. E. Watts of Ferris & Hamig and P. L. Korklan, General Electric Co. Sales Engineer.

"The space savings offered by G.E.'s Limitamp Control helped simplify the installation of a compressor station for the Laclede Gas Co. of St. Louis," according to H. A. Weigand of Ingersoll Rand Company. The compressor station is located in a residential area and conforms to local building codes. This put space requirements at a premium and posed a real installation problem.

Problems Solved by New G-E Limitamp* Control

fied installation where space considerations were a primary factor.

3. ADDED SAFETY. One of the nation's largest automobile manufacturers ordered eight of the starters and within days increased the order to 17. The gang-operated disconnect switch and co-ordination features which afford greater protection of the starter, the controlled equipment, and personnel were exactly what they wanted.

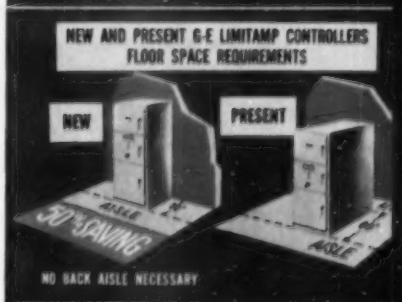
The 30" depth of the new Limitamp Control, which allows the unit to be transported through normal size doorways, has also received industry-wide approval. The unit's 90" height includes bus compartment which is surrounded by steel barriers within the enclosure.

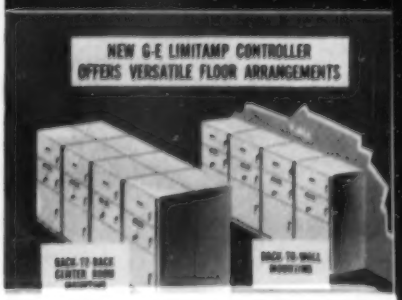
Other features which save time and money on installation and maintenance are the low-voltage panel, hinged to swing out of the cabinet, and the contactor which may be easily rolled in or out of the enclosure. This provides ample room for a worker to enter the enclosure while making installation connections.

This all-new Limitamp Control is ideal for high-voltage motors, rated 2300-4800 volts, up to 3000 hp, and may be applied to squirrel-cage, synchronous, wound-rotor, and multi-speed motors on power systems requiring high interrupting capacity for maximum short-circuit protection.

Specify the all-new Limitamp Control through your nearest G-E Apparatus Sales Office. G-E engineers will help apply this new control to your operation. For more information write for Bulletins GEA-6331, GED-2446, to Section 781-14, General Electric Company, Schenectady 5, New York.

*Trade-mark of General Electric Co.

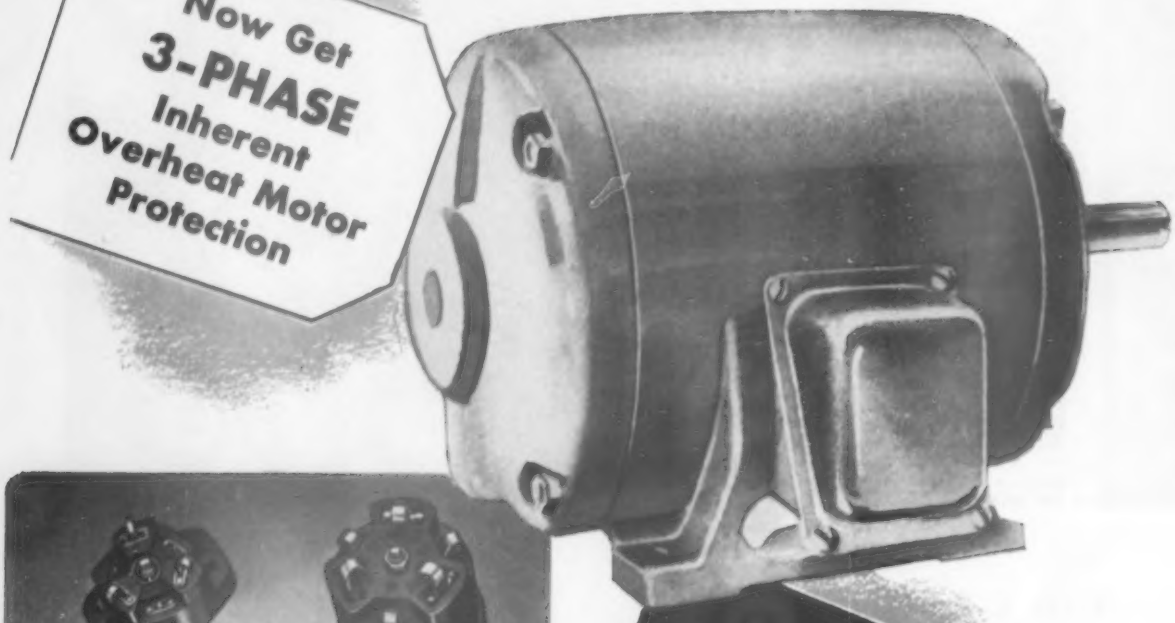



NEW G-E LIMITAMP CONTROLLER OFFERS VERSATILE FLOOR ARRANGEMENTS
BACK TO BACK CENTER AISLE ARRANGEMENT
BACK TO WALL MOUNTING

Progress Is Our Most Important Product

GENERAL ELECTRIC

Now Get
3-PHASE
Inherent
Overheat Motor
Protection



Specify Built-in
KLIXON
PROTECTORS
in Your New Motors

★ *Elimincte Motor Burnouts*
★ *Reduce Production Down Time*
★ *Minimize Motor Repairs and Replacements*
★ *Plus maximum motor capacity under any conditions*

Klixon Protectors in your 3-phase motors, single and dual voltage, are a sure way to keep today's rising operating and replacement costs down.

Built-in as an inherent part by the motor manufacturer, the Klixon Protector saves money and reduces idle machine time by preventing the motor from burning out under the following conditions:

1. Extremely heavy overloads
2. Single phasing
3. Stalling
4. Failure to start
5. Lack of ventilation
6. Increase in ambient temperatures
7. Plugging or reversing duty

This means that you have less equipment shutdowns . . . less motor repairs and replacements.

Klixon 3-phase Motor Protectors are available in four sizes — covering a range of horsepower ratings from fractional up through 7½ hp. (600 V.).

And remember, be sure to get complete motor protection in your single phase motor, too. Specify and use motors with Klixon Inherent Protectors. The additional cost is low . . . the savings high. Write for Bulletin MOPR1 which explains inherent motor protection.

KLIXON

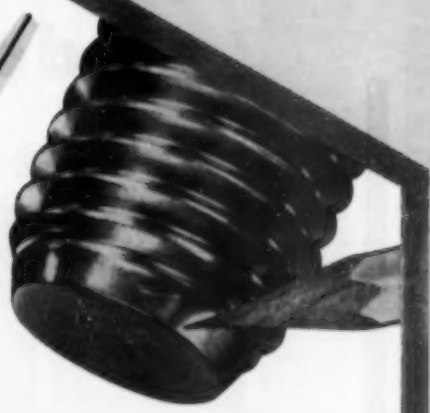
METALS & CONTROLS CORPORATION
SPENCER THERMOSTAT DIVISION
411 FOREST STREET, ATTLEBORO, MASS.

NOW

The Leader in Stainless Socket Cap Screws

OFFERS YOU

THE LEADER POINT



Allen's unthreaded Leader Point permits easier starting, reduces the possibility of cross threading, protects threads from damage if the screw is accidentally knocked or dropped. Your Allen Distributor stocks the largest range of sizes in 18-8 stainless cap screws available anywhere . . . 97 standard sizes #4 x ¼″ to ⅝″ x 3″ with NC threads; #10 x ⅜″ to ⅜″ x 1½″ with NF. Be sure to specify genuine Allen Leader Points.

Also standard with Grip Heads in popular sizes.

ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut, U.S.A.

STAINLESS SET SCREWS

With the improved Allenpoint, available from your distributor in 54 standard sizes #4 x ⅛″ to ½″ x 1″ NC and #10 in lengths from 3/16″ to ¾″ NF.

Sold only through leading Industrial Distributors.

Your fuel costs go down

when Clarage Unitherms...

go in!

Exclusive Feature saves you money

Clarage's unique Syncrotherm Control maintains uniform heating with relatively low temperature air in constant circulation. By-pass dampers control the amounts of air passing through and around heating coil. Result: better use of each BTU at lower cost. Investigate this and the other features of the Unitherm Unit Heater — available for steam or hot water operation, floor or ceiling installation, in a wide size range. Write for Catalog 1115.
CLARAGE FAN COMPANY, Kalamazoo, Michigan.

... dependable equipment for making air your servant

CLARAGE FAN COMPANY
Kalamazoo, Michigan
Canada Fans, Ltd., Montreal, Canada

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

FACTORY / CATALOG NEWS
Begins on page 158

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

18—Investment Casting. "Design With Microcast in Mind" outlines in pictures and text steps involved in process; traces history. Shows wide range of intricate parts that may be mass-produced. Tables of alloy properties. 12 pages. *Austenal Laboratories, Inc.*

19—Metal Finishing. Two technical bulletins are offered: PP-124 covers finishing of stainless steel; PP-125, finishing of aluminum and zinc base die castings. Both recommend methods and procedures for finishing many types of items. *Frederic B. Stevens, Inc.*

20—Plastics. Condensed catalog describes welding and spraying equipment, large moldings, weldments and component parts for welded fabrications. Offers seamless ducting, sheets, rods, bars, blocks of four plastics. Dimensions. 8 pages. *American Agile Corp.*

21—Tool Holders and Cutters. Spiral-bound, 44-pager includes carbide and high-speed steel milling blades available in any cutter style. Describes tool holders featuring chip control block with adjustable chip breaker. Offers replacement parts. *Viking Tool Co.*

INSTRUMENTS AND CONTROLS

22—Engineering Systems. 11 case histories include steel mill counter-controller, paper mill winding control, engine block scanner, particle size classifier, process correlator. Schematics illustrate each system. 12 pages. *Berkeley Div., Beekman Instruments, Inc.*

23—Infra-red Radiation Pyrometers. Bulletin describes two remote-detection instruments. Shows advantages of measurement of temperature variations without direct contact or interruption of process. *Servo Corp. of America.*

Turn the page

HERE'S ONE DOLLAR THAT BUYS MORE THAN IT DID 25 YEARS AGO!

. . . the dollar you invest in

SEALMASTER

BALL BEARING UNITS

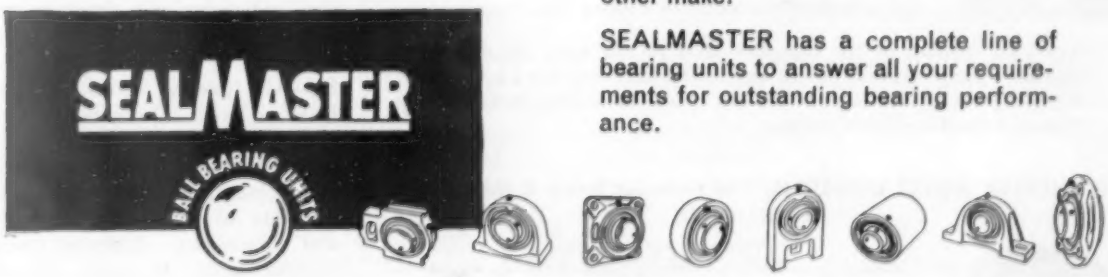
for products you build or buy!

Purchasing power of the dollar may have gone the way of the five cent cigar, but year after year SEALMASTER Bearing Units give you more and more for your component purchasing dollars.

SEALMASTER research and engineering continues to bring you the latest advances in bearing design and manufacture. SEALMASTER Bearing Units contain a combination of patented features you will find in bearing units of no other make.

SEALMASTER has a complete line of bearing units to answer all your requirements for outstanding bearing performance.

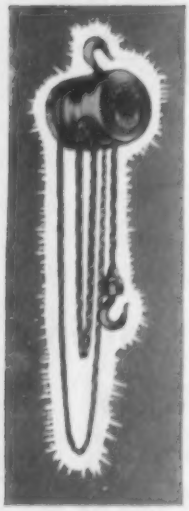
Factory Representatives and Dealers Located in All Principal Cities



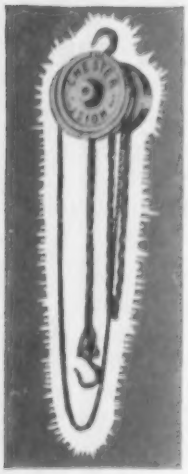
SEALMASTER BEARINGS A DIVISION OF STEPHENS-ADAMSON MFG. CO. • 1 RIDGEWAY AVE., AURORA, ILLINOIS

CHESTER HOISTS
get work done fast

NOW A COMPLETE LINE



NEW . . . ZEPHYR Lightweight, *spur-geared* . . . Built for safe, one-man handling by riggers, millwrights. Sizes from ½ to 2 tons. Fully encased, all-steel, *sealed* construction defies extremes of outdoor exposure and dusty atmospheres. Compact design requires minimum headroom, permits close-quarter operation. Spur-gearing makes the Zephyr fast and easy to operate even with capacity loads.



ELECTRIC . . . For fast, accurate, powered hoisting. Heavy duty or lightweight in 11 different sizes from ¼ to 2-ton capacities with up to 30-f.p.m. hoist speeds. Entire gear train is under continuous, sealed, splash lubrication. Permanently sealed ball-bearing motor. Spring clutch load-brake stops smoothly, suspends load without slippage even when power is shut off. Instant action motor brake stops hook immediately without jolt, prevents drifting. Push-button or pendent rope controls.

HEAVY-DUTY HAND CHAIN . . . *spur-geared* . . . There's a size that's dependable for your need. Hoist up to 25 tons fast with minimum effort. Timken bearings provide easy, smooth operation. Positive-acting retaining brake suspends load at any height. Low-friction swivel hook prevents chain twisting. Chain guide on load sheave prevents chain fouling.

Army types, extended handwheel and low headroom trolley hoists are available. Also, Chester produces a complete selection of low-priced differential hoists in sizes up to 1½-ton capacity.

Ask your distributor for complete facts on the new, lightweight Chester Zephyr Hoists, or on the electric or other hand hoists in the complete Chester line. Write for specification literature on the type of hoist that interests you.

CHESTER HOIST DIVISION, The National Screw & Mfg. Co.
LISBON, OHIO

National — Fasteners — Hodell Chains — Chester Hoists

FACTORY / CATALOG NEWS
Begins on page 158

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

24—Controllers and Timers. Four bulletins are offered. Cover drum type controllers for process time and sequence control; pressure-temperature controls; interval timers; timing pushbutton. Include operation and application data. Diagrams. *Seety Instrument Co.*

25—Analog Computer Components. A versatile array of electro-mechanical general purpose "building blocks" are described in this 12-page brochure. Discusses control systems, problem solving, data processing. Includes service units. *Servo Corp. of America.*

26—Controlled-Air-Power Devices. Bulletin ML-3 presents such items as drill press feeds, vises, hydrochecks, rotary feed and index tables, self-contained drilling units, valves and cylinders. Shows air motor with interchangeable valves. 8 pages. *Bellows Co.*

27 — Electric Proportional Controllers. Bulletin 4-11 describes a complete line for control of dewpoint, pressure, temperature, etc., in batch process, combustion atmosphere, and heat treating furnace applications. Explains functions, design features. *Foxboro Co.*

PIPELINES & FITTINGS

28—Plastic Pipe. Physical and chemical properties of a pipe made from woven glass impregnated with "Teflon" resin are listed in Bulletin FTL-1. Suggests applications for this chemically inert, corrosion-proof pipe. Flanging and coupling. *Resistoflex Corp.*

29—Air Release Valves. Bulletin 1204 contains information on requirements, operation, and construction of valves for water, sewage, and other industrial uses. Illustrates methods of installation. Weights and dimensions. Includes special purpose units. 8 pages. *Simplex Valve & Meter Co.*

Turn the page

At Minnesota Mining and Manufacturing Company (known as "3 M"), they say,

"He's America's No. 1 stick-up man!"

"Need a 'Scotch' brand tape for grafting trees? Wrapping a new automobile? Splicing a rug?

"We have 'em – and hundreds more," says "3 M" Executive Vice-President L. F. Weyand. "No wonder they call me the 'stick-up man.'

"But there's one kind of sticky tape you won't find around here, and that's *red* tape. When our dealers or customers ask for a shipment in a hurry, we take them at their word.

"We call Air Express – and the shipment is delivered in a matter of hours!

"We know we can depend on Air Express. We prove it hundreds of times a year. What's more, we *save money* by using Air Express. A 25 lb. shipment from St. Paul to Miami, for example, costs $13.65 door to door (one charge). That's 20¢ less than *any* other air carrier – and the service just can't be compared!"

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY

"THIS LUBRICANT ENABLED US TO INCREASE PRODUCTION"

says—PITTSBURGH TUBE COMPANY

"Our 70,000 pound Draw Bench was designed to operate at a maximum of 80 feet per minute, full load. We decided to increase the drawing speed on lighter tubing to 100 and 104 feet per minute. This overloaded the Speed Reducer, however, causing it to overheat. We tried four different makes of oils without success before trying LUBRIPLATE A.P.G. 90. With LUBRIPLATE, we are able to pull heavier tubing than before at 104 feet per minute without the Reducer overheating."

R. S. Vorous
Maintenance Engineer

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose... LUBRIPLATE H.D.S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

FACTORY / CATALOG NEWS

Begins on page 158

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

30—Plunger Pumps. Featured in Bulletin W-414-B-45 A are triplex single-acting units, with capacities to 225 gpm., pressures to 11,700 psi. Describes use in hydraulic press systems, descaling systems, process pumping, and other jobs. 12 pages. *Worthington Corp.*

31—Flexible Metal Hose and Expansion Joints. Catalog 149 features three types of hose; high- and low-pressure joints. Discusses construction and applications; materials, anchoring and guiding. Exploded views of essential parts. 8 pages. *Flexonics Corp.*

32—Protective Coating. Subject of this brochure is a coal tar coating in tape form with coating on both sides, to serve as corrosion protector and adhesive bond. Shows how to protect pipe, pipe joints, fittings, coatings. Table of coverage. *Tapecoat Co.*

33—Pumps and Controls. 56-page Catalog 5001A covers oil-hydraulic units — pumps; pressure, volume, direction controls; control assemblies, hydraulic motors; transmissions, cylinders; hydraulic assemblies. Well illustrated; many tables. *Vickers Inc.*

34—Insulation. A cellular, stay-dry glass material for piping and equipment is the subject of this 8-pager. Covers physical properties, sizes and shapes available, suggested thickness for temperatures from –50 to 8000 deg. F. Other useful data. *Pittsburgh Corning Corp.*

35—Flexible Metal Hose. Technical Data Book U-333 offers bronze, carbon steel, monel, nickel, or stainless steel types to compensate for conditions of varied pressure, elevated temperature, motion, vibration in range of problems. *Universal Metal Hose Co.*

36—Motor-Pumps. General purpose, centrifugal, cradle-mounted types are featured. Presents units with capacities of 5 to 2800 gal.

WAIT,

Mr. Plant Owner!

Before you start that New Expansion, it will pay you to hear the...

MONTGOMERY STORY

of new production and sales opportunities in Alabama's Capital City, Hub of Southern Progress!

Industrial and Business Leaders of Montgomery are ready and eager to give you the full story of Montgomery's Advantages!

- Favorable climate for year-round operation
- Plentiful supply of native labor, easily trained
- Served by 35 truck lines, 6 major railroads, 2 airlines
- Plentiful power and water supply—natural gas
- Located in the heart of new and growing markets
- Many attractive sites available in and near city

We WANT Your Plant!
We HAVE A PLACE For You!
Let Us Tell You About It!

Call, Write or Wire
Industrial Committee,
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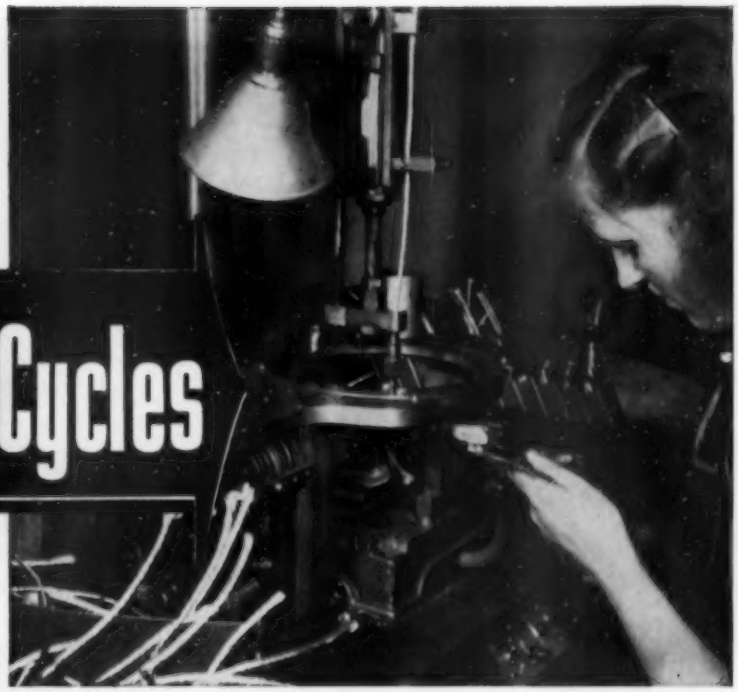
P.O. Box 79
Montgomery, Alabama
Phone 4-8416

How's this for Air Cylinder Economy?

31,000,000 Cycles



...in an atmosphere laden with carbon dust

Carbon dust is highly corrosive. Few air cylinders can withstand its ruinous effects. But the Bellows Air Motor — the air cylinder with the built-in valve — has completed more than 31,000,000 cycles in the plant of Electronite Carbon Co., Philadelphia — and is still going strong.

But the exceptional durability of the Bellows Air Motor on this installation is only a small part of the story.

This special machine, designed and built by Bob Silver, Electronite's Chief Engineer, uses a Bellows Air Motor to tamp wire shunts into carbon brushes. And in brushes, shunt contact must be perfectly matched to assure uniform distribution of current load. The Bellows Air Motor provides the day-after-day repetitive accuracy required for constant uniformity. Rejects dropped from 10% to one-half of 1%.

And, in addition, as Bob Silver put it, "We get at least two to four times the speed of production using the automatic method."

The Bellows Air Motor and its related "packaged" power units: rotary and linear work feeders, work holding devices, drill units, etc., make tool-room design and construction of special production machines practical and inexpensive for both long and short run operations — multiply fractional savings into an impressive cost reduction figure.

OPERATION PUSHBUTTON

The story of Electronite Carbon Co. is but one of many dramatic uses of "Controlled-Air-Power" featured in the new motion picture, "Operation Pushbutton." This half-hour 16 mm sound picture shows how industries all over the United States and Canada are applying engineer ingenuity to production processes. We'll be happy to arrange a showing for you. Write The Bellows Co., Dept.FA1155, Akron 9, Ohio, or phone your local Bellows Field Engineer.

1187-A

The Bellows Co.

AKRON 9, OHIO

Bellows Pneumatic Devices of Canada, Ltd., Toronto

FLASH DRAINAGE!

Cambridge

WOVEN WIRE CONVEYOR BELTS

permit continuous washing, degreasing, quenching

Open mesh construction permits rapid drainage of process solutions, moving belt eliminates batch handling to provide continuous pickling, quenching, tempering, washing, degreasing. All-metal belt resists corrosion even under the most severe conditions.

In continuous heat treating installations Cambridge Woven Wire Conveyor Belts are impervious to damage at temperatures up to 2100°F. They have no seams, lacers or fasteners to wear more rapidly than the body of the belt . . . no localized weakening. Open mesh construction lets heat and gases circulate freely all around the work for uniform treatment.

No matter how you look at it, CAMBRIDGE Woven Wire Conveyor Belts are invaluable aids to AUTOMATION . . . eliminate profit-stealing batch and hand operations. They are made in any size, mesh or weave, and from any metal or alloy. Special raised edges or cross-mounted flights are available to hold your product during movement.

Here's how a Cambridge belt permits CONTINUOUS WASHING. Stamping and drawing compounds, and metallic particles are washed through open mesh.

Call in your Cambridge Field Engineer to discuss how you can cut processing costs by continuous operation. You can rely on his advice. Write direct or look under "Belting, Mechanical" in your classified telephone book.

ASK FOR FREE 130-PAGE REFERENCE MANUAL illustrating and describing woven wire conveyor belts. Gives mesh specifications, design information and metallurgical data.

The Cambridge Wire Cloth Co.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

DEPARTMENT E, CAMBRIDGE 11, MARYLAND

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

per min.; pressures of 10-525 ft. Data on design modifications, performance, and dimensions. 16 pages. *Ingersoll-Rand.*

37—Coupling. Here's the story on a quick-connect, quick-disconnect high-flow coupling designed for maximum flow with minimum pressure drop; easy maintenance. Engineering data, information on spare parts. Cross-section view. Bulletin 230. *Snap-Tite, Inc.*

38—Rubber-Lined Valves. Condensed bulletin deals with gate and horizontal swing check valves for corrosive service. Points out economy of this type of construction—iron body, hard rubber lining. Tables of size and dimensions. *Darling Valve & Mfg. Co.*

39—Centrifugal Pumps. Flooded plants may be interested in Bulletin 55. It describes a 20,000-gph. pump for use with 15-hp. twin cylinder engine that may be used with single cylinder gas engine, diesel engine, or electric motor. *Rice Pump & Machine Co.*

40—Valves. Circular No. 592 features corrosive-service gate valves made of "Causul" metal—originally designed for handling CAUstic soda and SULphuric acid. Offers patterns with screwed or flanged ends, stainless steel or monel trims. *Lunkenheimer Co.*

41—Control Valve. Pilot-operated unit that converts from pressure-reducing and regulating to back-pressure control by simple switch of control lines is described in Bulletin 966. Gives pressure and temperature ratings. Materials available. *A. W. Cash Co.*

42—Pipe, Fittings, Valves. Catalog 965 tells how these resin-impregnated graphite units are lightweight, unaffected by most corrosives, immune to effects of thermal shock, non-contaminating. 12 pages. *Falls Industries.*

Turn the page

HOW TO BUY V-BELTS

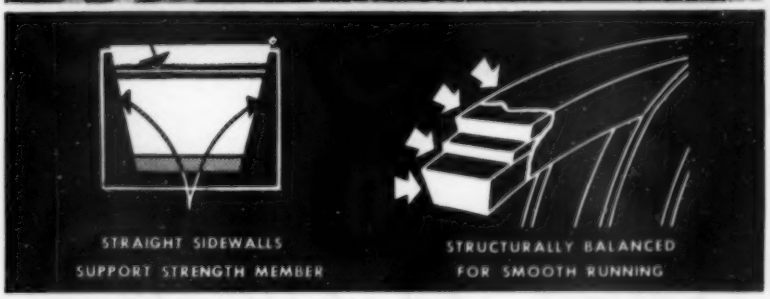
FOR MORE POWER AND LONGER LIFE

...and get "More Use per Dollar"

Look for a V-belt construction that provides longer life under shock loads . . . extra strength with the use of the right synthetic strength member.

Precision balance of all parts of the V-belt makes for a smoother running drive, fewer matching problems . . . and longer life for all belts on a multiple drive. Belt strength members of super-strength cords should be correctly positioned in the neutral axis section of the belt so as not to stretch or compress unnecessarily as the other parts of the belt are flexed in use. Straight belt sidewalls help support strength members in a straight line, permit all cords to pull equally . . . deliver their full share of power. You get more grip, less slip because the belt presses tightly against the sheave grooves when rounding pulleys.

Specify by name the V-belt engineered to give you extra strength and extra pulling power . . . specify R/M Super-Power V-Belts.



R/M SUPER-POWER AND CONDOR V-BELTS

For longer life under shock loads, R/M Super-Power V-Belts have a new synthetic super strength member which delivers up to 40% more horsepower capacity; fewer belts can be used on the same drive for the same horsepower. They are oil-proof, non-spark and heat resistant. Both R/M Super-Power and standard Condor V-Belts have straight sidewalls with strength members micro-positioned and destretched during manufacture. This prevents power waste and frequent shutdown for belt take-up. Let an R/M representative show you why R/M Super-Power or Condor V-Belts last longer . . . give you "More Use per Dollar".

R/M

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

LOW-COST, DEPENDABLE

HEATING

***WHERE* you want it . . . *WHEN* you want it!**

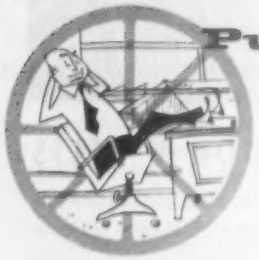
Nelex Mineral Insulated (MI) Heater Units are the answer to *thousands* of problems involving the direct application of controlled heat. They offer the first really practical, low-cost solution to de-icing and freeze prevention needs. In many cases they do a more efficient, more economical job of surface heating, pipe heating, compound, and solution heating.

Nelex MI Heater Units are rapidly finding their way into every industry from appliance manufacture to molasses; from textiles to refineries. Low original cost, ease of installation, and accurate thermostatic control give them a wide range of application for industrial heating. For further information, write for Bulletin No. 1603, or see your nearest Nelson Sales Office or authorized distributor.

NELEX MI HEATER UNITS

a product of . . . NELSON *Electric* MANUFACTURING CO. TULSA, OKLAHOMA

Manufacturers of electrical control equipment for industry



Put Your "Brains"

On Wheels

Don't limit your brainpower to the mobility of a chair.

Frequent trips through your plant in an Agricola TS by the "brains" will:

1. Spot bottlenecks before they develop.
2. Catch the countless money wasters in your operation.
3. Make possible further expansion without additional supervision.
4. Keep production lines flowing smoothly.

Result: More profits for you!

Write for information

AGRICOLA FURNACE CO., INC.
Gadsden, Alabama

Agricola Furnace Co., Inc.
Gadsden, Alabama

Gentlemen:
Prove to me an Agricola TS will save me money in my plant.

Name_____

Company_____

Address_____

City_____ State_____

FACTORY / CATALOG NEWS

Begins on page 158

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

43—Forged Steel Valves. Bulletin 551 illustrates stop, stop-check, and needle valves for applications including steam power stations, boiler piping, chemical service. Lists 13 design details, showing cross-section views. Pressure temperature ratings. *Edward Valves, Inc.*

VIBRATION CONTROL

44—Self-Leveling Isolators. Slim-Jim folder of 6 pages tells you how to make an easily conducted plant survey to uncover eight common sources of production losses. Photos illustrate use of "Barrymounts" in different types of operations. *Barry Controls Inc.*

45—Vibration Monitors. Bulletin 500-4 describes an electronic "Vibraswitch" for protecting heavy equipment against costly damage when malfunctions occur. Covers applications, advantages, special features, operation. Specifications, ordering hints. *Beta Corp.*

46—Mountings. The "Floating Pillow"—a pair of rubber-in-shear isolators mounted between semi-steel base and cover—is the subject of Catalog FP-55. Includes data on load capacities and frequencies. Illustrations of typical installations. *T. R. Finn Co.*

PROCESSING

47—Waste Treatment. Process Data Sheet 700(2) outlines electrical and pneumatic control systems for acidic, alkaline, and various toxic wastes. Shows components. Discusses "controllability factors." *Leeds & Northrup Co.*

48—Magnetic Pipeline Traps. Two models are described and illustrated in Bulletin B-605. Tells how they assure product purity; reduce damage to filters, mixers, pumps; eliminate clog-ups. Installation data. *Eriez Mfg. Co.*

Turn the page

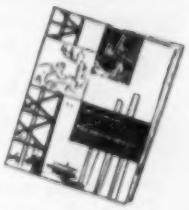
Are single-purpose lubricants SLOWING DOWN YOUR OPERATION?

Cut costs with Pure's "Simplify and Save" plan

If your plant lubrication system is complicated by dozens of single-purpose lubricants, *The Pure Oil Simplify and Save plan* can save you real money.

You see, Pure Oil has perfected a line of *multi-purpose* lubricants. In most cases just six of these money-saving lubricants are all you need for your entire plant. Speeds application. Reduces inventory. Minimizes mis-application. Simplifies lubrication and stock control. Streamlines purchasing.

Why not phone your nearest Pure Oil office and see how this simplified plan can cut costs for you. Reverse the charges—and call now.



Free Booklet tells you "How to Simplify and Save". Write The Pure Oil Company, 35 E. Wacker Drive, Chicago 1, Illinois.

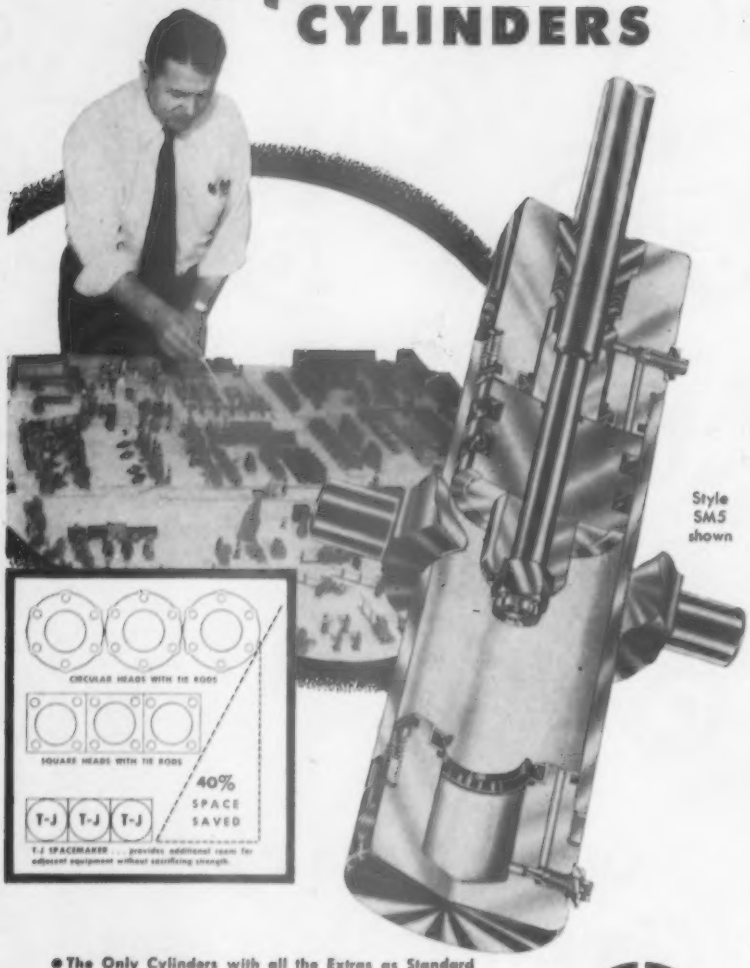
BE SURE PURE WITH PURE

Be sure with Pure **PURE MULTI-PURPOSE LUBRICANTS**

Sales offices located in more than 500 cities in Pure's marketing area

Automate for top performance with...

T-J Spacemaker CYLINDERS



Style SM5 shown

- The Only Cylinders with all the Extras as Standard
- OIL pressure to 750—AIR to 200 P.S.I.
- New Compact Design . . . Saves up to 40% Space
- Proven Performance . . . with Extra High Safety Factor
- Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Oil Cushion
- Hard Chrome Plated Bodies and Piston Rods (Standard)
- Only from T-J can you get these new ingenious cushion designs

OFF SHELF DELIVERY

More and more of industry's automation problems today—solved with T-J Spacemaker Cylinders! New compact design and many more plus features for a new high in efficient cylinder performance and dependability. Wide range of styles, capacities . . . to help you *save labor, reduce costs* on all kinds of push-pull-lift jobs. Send for bulletin SM-155-1. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

Member of the National Fluid Power Association

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

49—Sintered Bronze Filters. "Modern Filtration" describes a porous element that removes all contaminants over 10 microns in size; never needs replacing and is unaffected by extreme temperatures and most corrosive fluids and gases. 10 pages. *Permanent Filter Corp.*

50—Electric Cartridge Heaters. Bulletin 850 covers a range of "Chromalox" spot heaters easily installed in dies; platens; molds; hot-process, heat-sealing equipment; similar applications requiring controlled work temperatures to 1000 deg. F. *Edwin L. Wiegand Co.*

51—Heat Transfer Fluids. Technical data folder discusses characteristics of fluids for temperatures to 500 deg. F. Gives uses in chemical processing equipment, rubber and plastic extruders and mixers; metal-bonding presses. *Carbide and Carbon Chemicals Co.*

52—Electric Heaters. A multi-pass unit for a wide range of services in heating oils and process liquids is described in Bulletin 102.1. Exterior and skeleton views. Typical flow diagrams. Specs on materials and operating ranges. *Hynes Electric Heating Div.*

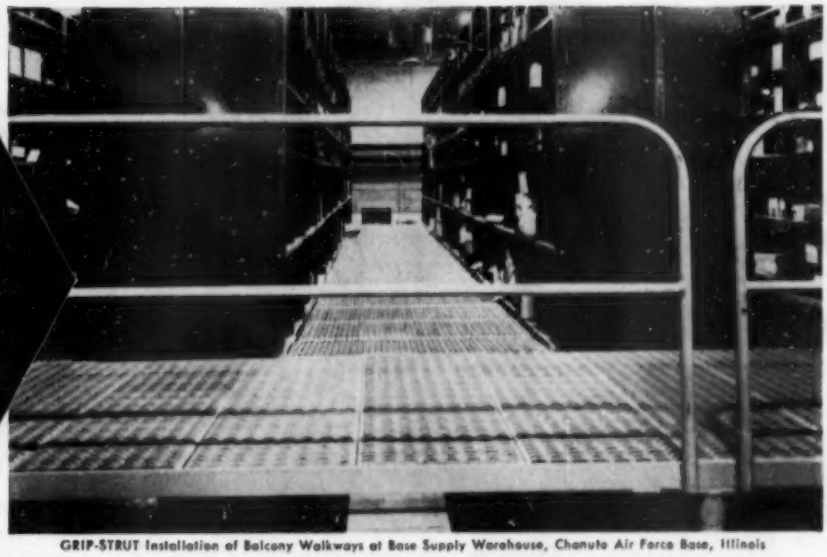
ELECTRICAL

53—Electronic Controls. Non-technical information on installation, performance, and maintenance of "Dynamatic" electronic control. Explains how stepless speed control of rotating equipment is accomplished. Gives circuit diagrams. 16 pages. *Eaton Mfg. Co.*

54—Insulation. The "Silco-Flex" all-silicone-rubber insulating system for motor and generator stator windings is discussed in this folder. Explains why it has superior electrical, thermal, mechanical properties, as well as desirable chemical properties. Well illustrated. *Allis-Chalmers Mfg. Co.*

Turn the page

USE THE FREE AIR ABOVE



GRIP-STRUT Installation of Balcony Walkways at Base Supply Warehouse, Chanute Air Force Base, Illinois

TO ENLARGE YOUR PLANT AND STORAGE AREAS WITH...

Balcony of GRIP-STRUT used to store body patterns, Body Div. Pontiac Motor Car Co., Pontiac, Mich.

Another view showing GRIP-STRUT balcony walkways and stairs at Chanute Air Force Base, Illinois

EASY-TO-ERECT ECONOMICAL

GRIP-STRUT BALCONIES

Now you don't have to extend walls to get more plant or storage room. Just use the air above your present areas to get more space with GRIP-STRUT balconies.

BIG ECONOMY FEATURES: No extra light needed below—no extra heat. No additional supports necessary because channels are an integral part of the material. No secondary sprinkler heads needed. Self cleaning. GRIP-STRUT can be cut and installed like lumber by your own maintenance force. Extremely economical—low in original cost.

IMPORTANT SAFETY FEATURES: Fire proof, slip proof, maximum strength with minimum weight. Easy to stand on, cool in summer, warm in winter.

Safety GRIP-STRUT is the new, basic material, all in one piece (including channels), not welded, riveted or expanded, in steel or aluminum, in standard sizes and gauges. Safety GRIP-STRUT presents an open space, in a diamond pattern, in excess of 55% of the area for positive NON-SKID footing in all directions. Ideal for work platforms, stair and ladder steps, flooring, balconies, catwalks, machinery guards, fire escapes and for original equipment safety treads. Write for new catalog today.

Distributors in all principal cities.
Consult yellow pages in phone book under "GRATING"

GRIP-STRUT

The **GLOBE** *Company*

GRIP-STRUT DIVISION

MANUFACTURERS SINCE 1914

4014 S. PRINCETON AVE. • CHICAGO 9, ILLINOIS

JACK of all trades ...and good at all of 'em!

HEIN-WERNER HYDRAULIC JACKS

save time and labor— cut costs to the bone

Hein-Werner Industrial Jacks offer powerful hydraulic force to simplify moving machinery, lifting heavy loads, pulling gears and pinions, bending rods, pressing bushings, and other tough industrial jobs. They are fast, safe, easy-to-use. May be used in a horizontal or vertical position. Models of 12 ton and larger have carrying and positioning handles. 30, 50, and 100 ton models have tandem pump for two-speed operation, and a drilled base for installation of pressure gauge. 12 and 20 ton models can be furnished promptly with gauge on special order.

Priced too low for you to be without 'em... order today!

Model	Capacity	Price
20.10AA	20 Tons	$46.00
30.11AA	30 Tons	89.30
50.12AA	50 Tons	135.00
100.12AA	100 Tons	297.50

Hein-Werner also manufactures Hydraulic Industrial Jacks in models of 1½, 3, 5, 8, and 12 tons capacity, as well as "Push and Pull" Hydraulic Jacks of 4, 10, and 20 tons capacity.

See your industrial supply distributor or write us.

HEIN-WERNER CORPORATION
WAUKESHA • WISCONSIN

Hein-Werner HYDRAULIC JACKS

FACTORY / CATALOG NEWS
Begins on page 158

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

55—Wiring Devices and Specialties. 68-page anniversary catalog includes such items as extension and cord sets, fuses, lamps, wall plates, pushbuttons, flashing devices. Presents about 100 new items. Color-illustrated. Cross-indexed. *Eagle Electric Mfg. Co.*

MATERIALS HANDLING

56—Steel Shelving. 48-page Catalog FF-188 aids selection for standard and special requirements. Covers storage shelving, shop equipment, and storage cabinets. Photos of installations in a variety of applications. Detailed specifications. *Remington Rand Div.*

57—Fork Trucks. Bulletin 1327D describes a line of battery-powered trucks with capacities of 1500, 2000, and 2500 lb. Contains tables of dimensions, capacities, weights, speeds. Details design and construction. Illustrates attachments. 6 pages. *Baker-Raulang Co.*

58—Dockboards and Ramps. Solutions to 13 difficult dock loading and yard loading problems are outlined in this folder. Line drawings illustrate each problem, and photos show how they're solved with magnesium dockboard or yard ramp. *Magnesium Co. of America.*

59—Conveyor Belts. The "Automation" line is described in this data sheet—tan Koroseal belt resistant to chemicals and oils; black, all-purpose oil-proof belt; green belt recommended for "eye-rest" color; economy version (not oil-resistant). *B. F. Goodrich Co.*

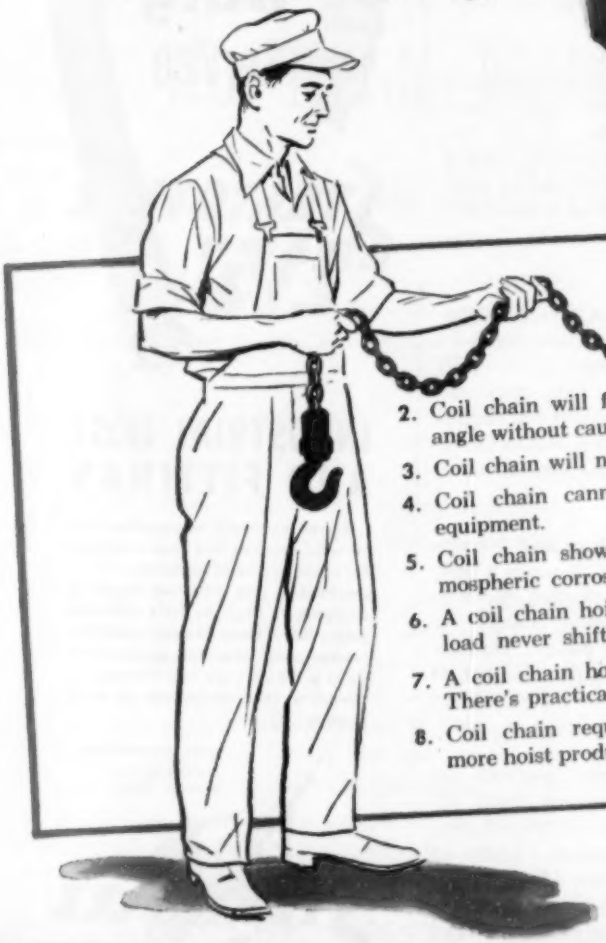
60—Die Handling Trucks. Here are the details on a hydraulic line with capacities of 10,000 to 80,000 lb. Engineering drawings and accompanying text cover design and operation information. Major components are illustrated. Includes operating photos and specs. *Elwell-Parker Electric Co.*

Turn the page

QUIK-LIFT ELECTRIC HOISTS,
17 models, capacities from 500 to 4,000 lb.

"what's so good about COIL CHAIN *on Electric Hoists?"*

Coffing Quik-Lift Electric Hoists are offered with coil chain. There are many good reasons why.



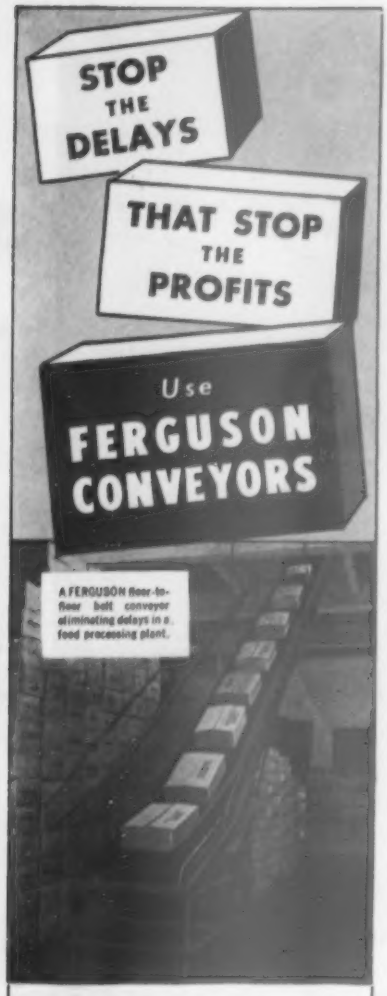
1. A coil chain hoist has 360-degree flexibility — can reach out to any side for its load.
2. Coil chain will feed into the hook-suspended hoist at an angle without causing trouble.
3. Coil chain will not wind up or kink regardless of load.
4. Coil chain cannot fray, causing damage to hands and equipment.
5. Coil chain shows greatest resistance to chemical and atmospheric corrosion.
6. A coil chain hoist may be hook-suspended since weight of load never shifts as the load is lifted.
7. A coil chain hoist may be adapted for any height of lift. There's practically no limit to length of chain you can use.
8. Coil chain requires less maintenance, therefore, there is more hoist production time.

That's what's so good about coil chain. Yet it is only one of many features that make Coffing Quik-Lifts your *soundest* electric hoist value. For full details, write for bulletin ME.

Coffing Hoist Division
Duff-Norton Company
Danville, Illinois

Hoist-Alls • Safety-Pull Ratchet Lever Hoists • Mighty-Midget Pullers • Spur-Gear Hoists • Differential Chain Hoists • Load Binders • I-Beam Trolleys

SOLD BY DISTRIBUTORS EVERYWHERE



Company after company in almost every industry stop materials handling delays with FERGUSON CONVEYORS. And, they get more value per dollar spent because these conveyors:

- Shorten Paths of Travel
- Reduce Congestion
- Coordinate Production, Inspection, Packaging and Shipping Lines
- Move Material More Directly
- Increase Plant-wide Efficiency

Proof of performance is the constant number of reorders for FERGUSON CONVEYORS from satisfied users.

Write, wire or call today for details on FERGUSON power, roller or wheel conveyors that can stop the delays in your plant.

HARRY J. Ferguson COMPANY

143 WEST AVE., JENKINTOWN, PA.
Turner 4-4401

FACTORY / CATALOG NEWS

Begins on page 158

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

61—Conveyor Strip. Bulletin shows how gravity wheel "Flow Track" saves handling costs four ways—conveying between machines, holding pallet loads, moving large sheet materials, bundle items, cylindrical objects. Specs on two sizes. *Rapids-Standard Co.*

62—Steel Shelving. 32-page catalog describes construction and installation features of "Unitized Flexi Steel Shelving." Illustrates 24 of its many different units. Offers detailed information on how to plan a shelving layout. Form No. 6039 *Borroughs Mfg. Co.*

63—Fork Trucks. Users and prospective users should read "Facts About Fork Trucks." Gives cost comparison of depreciation, maintenance, power costs of gas vs. electrical model. Based on 8-hour shift operation 313 days a year. *Lewis-Shepard Products, Inc.*

64—Locomotive. A diesel-hydraulic unit designed for industrial jobs is presented in Bulletin 2006. Tells how it's suitable for light track and bridge structures; how it can negotiate, uncoupled, a 30-ft. radius curve. 8 pages. *Baldwin-Lima-Hamilton Corp.*

65—Magnetic Pulleys and Separators. Bulletin 303-C features a new, simplified pulley selection method. Tells how 2-coil design enables use of smaller diameter pulleys. Double-page cutaway shows 10 construction features. 16 pages. *Stearns Magnetic, Inc.*

66—Loader. Bulletin presents details on a front-wheel drive vehicle featuring no-clutch shifting for directional control. Lists 15 other features of this 15 cu.-ft. capacity loader. Specifications, drawings of engineering details. *Napco Construction Equipment.*

67—Three-Way Truck. Here's the story on "Moto-Bug." Shown are standard chassis; three easily interchanged attachments it's provided

INDUSTRIAL HOSE AND FITTINGS

Super resistance to abrasion and corrosion makes this hose excellent for railroads, road equipment, farm machinery, and materials handling equipment. High tensile strength single wire braid. Tough synthetic rubber cover. Working pressures to 2500 psi. Bulk hose and fittings . . . complete hose assemblies at your dealer.

Write for BULLETIN
Dealerships open in some areas.

STRATOFLEX

STRATOFLEX, INC. FORT WORTH, TEXAS
P. O. BOX 10398

BRANCH PLANTS
LOS ANGELES AND TORONTO
SALES OFFICES
ATLANTA • CHICAGO • NEW YORK • SAN FRANCISCO
DAYTON • HOUSTON • KANSAS CITY • PORTLAND • TULSA
IN CANADA
STRATOFLEX OF CANADA, INC. TORONTO 18, ONTARIO

Powder-washing blowpipes have replaced swing grinders and chippers in removing defects and riser pads from railroad diesel trucks. Work is done faster and more efficiently—preheating is rarely necessary.

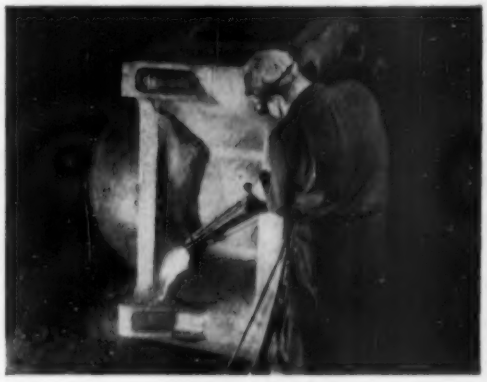
Powder-washing blowpipes remove riser pads in locations virtually impossible for other methods. Risers between flanges of this valve body have already been washed away—note the smooth clean finish.

Why Powder-Washing is a Standard Tool in Modern Foundries

Powder-washing is the fastest, most efficient method for gouging and removing fins, pads, and stubs from casting surfaces and hard-to-reach places.

* Powder-washing is faster than grinding or chipping, and finished surfaces are clean and smooth.
* Powder-washing tools are quiet, easy to operate, and less fatiguing than chipping tools and grinders.
* In powder-washing, metal powder is added to the washing flame. This raises its temperature, and provides greater speed and control in cleaning sand and metal from castings. This process is effectively used to gouge or wash iron, steel, bronze, and some of the more complex oxidation resistant alloys.

Your local LINDE representative will be glad to give you detailed information on the powder-washing process, and help you determine the setup to best serve your foundry needs. Save time and money—call him today.



LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

Linde
TRADE-MARK

"Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

Faultless CASTER MATERIALS HANDLING FACTS

NEITHER DIRT, ABRASIVE DUSTS, 330°+ TEMPERATURES NOR WATER STOP THESE CASTERS AT CHRYSLER PLANT

CUT-AWAY VIEW OF DOUBLE BALL BEARING SWIVEL

200 SERIES HEAVY DUTY SWIVEL PLATE CASTER SHOWN WITH SEMI-STEEL WHEEL

Faultless Casters at Evansville, Indiana, Chrysler Body Plant help keep Plymouth production at high rate. A constant procession of Faultless Castered dollies as shown above carry Plymouth bodies through more than 500 production steps. Rough formed bodies are secured to drag line operated conveyor dollies, for travel through production from first to last. During each production cycle Faultless Casters encounter sand and abrasive dusts, must roll through dirt-laden water and through drying ovens heated above 330°F. At no point can break-downs or delays be tolerated. That's why Faultless Series 200 Casters with double ball bearing swivel heads, and roller bearing semi-steel wheels were specified by Chrysler engineers.

We are proud of this Faultless performance for Chrysler and yet this is but one of the hundreds of tough jobs Faultless Casters have solved for men in industry. Do YOU have a materials-handling problem? Our experienced engineers will gladly provide you with helpful data, if you simply phone or write, no obligation.

Bodies are here being sprayed and will proceed to drying areas. No hindrance to these Faultless Casters is experienced even after going through 330°F. ovens hundreds of times.

2700 Series Heavy Duty Rigid Plate Companion to the 200 Series Caster. Cut-away view of Roller Bearing Wheel.

FAULTLESS SOLVES THE TOUGH JOBS

FAULTLESS CASTER CORPORATION

FACTORY / CATALOG NEWS

Begins on page 158

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with—hopper, platform, fork lift. Tells how they enable loading, lifting, hauling all types of materials. 8 pages. *Kwik-Mix Co.*

68—Sheet Grabs. "Mansaver Grabs" for handling ferrous and non-ferrous metals in almost every form are shown in this folder. Includes ½- to 50-ton units, hand or motor. Details of the operating mechanism. Dimensions and capacities. *Mansaver Industries, Inc.*

69—Magnets. Lifting and separation magnets and magnet control equipment are shown in 4-page Catalog 114. Details on how they work, how suspended, design features. Line drawings, schematic and dimension diagrams. Selection table. *Ohio Electric Mfg. Co.*

70—Portable Lift. Hand and battery-powered hydraulic models with capacities to 2000 lb. are described in this 8-pager. Photos show them on shipping and receiving, machine set-up, work in process, warehousing, maintenance, one-man order-picking. *Oster Mfg. Co.*

POWER TRANSMISSION

71—V-Belt Drives. 72-pager on "Texrope" constant speed drives is divided into sections on design features, drive principles, quick selection tables, non-stock drives, special drives. Handy index of the 20 tables in Tex-Book 20P40. *Allis-Chalmers Mfg. Co.*

72—Variable Speed Drives. Bulletin on "Speed-Trol" line discusses inner workings of pulley design. Information on factors in drive selection. Descriptions of many types of automatic and remote control accessories available. *Sterling Electric Motors, Inc.*

73—Speed Reducers. Worm gear types are the subject of this 8-page booklet, "Always on the Job." Photos show them doing five jobs—on tumbling barrels, in pushbutton

HOFFMAN'S ENGINEERED SYSTEMS designed to do the tough jobs in industry

HOFFMAN BLOWERS PROVIDE HIGH CAPACITY, LOW COST, CONTINUOUS AIR SUPPLY

" (1) No possible contamination of air by oil.

" (2) Low noise level.

" (3) No close tolerances required for centrifugal blower and therefore a longer life.

" (4) The outlet volume and the associated motor load can be varied readily by throttling.

These four factors, in an engineer's memorandum, explain the selection of Hoffman 50-HP Multi-Stage Blowers for air agitation of the plating baths in a major automotive plating department.

The blower section of the plating department — all engineered and installed by Nankervis Company, is shown in the accompanying picture.

Only part of the Hoffman Multi-Stage story was needed to sell this installation. For the Hoffman design uses a single dynamically balanced multiple effect impeller assembly. No close clearances are needed . . . no valves, vanes, gears, rollers, pistons, or other impacting parts. There is no vibration, no pulsation, no internal lubrication, practically no wear. These blowers run continuously for years on end. Their power consumption is directly proportional to the actual volume of air moved—under pressure up to 9 lbs. psi., or under vacuum up to 12 inches Hg.

When you have air problems, involving *any* volume—at moderate vacuum or pressure, be sure to check the Hoffman Multi-Stage Blower-Exhauster. Our engineers will be glad to work with you.

U. S. HOFFMAN MACHINERY CORP.

AIR APPLIANCE DIVISION

103 FOURTH AVENUE, NEW YORK 3, N. Y.

INDUSTRIAL FILTRATION DIVISION

Machine Tool Coolant Clarifiers—Flotation, Mechanical, and Magnetic.
Lubricating and Insulating Oil Conditioners, Filters, and Vaporizers
Solvent Recovery Systems—Vacuum Stills and Filters

METAL FINISHING DIVISION

Mechanized Metal Cleaning and Phosphatizing Systems
Chemical Plating Equipment
Electrostatic Spray Painting Equipment
Paint Booths and Bake Ovens
Filters for Phosphate and Plating Solutions—Waste Disposal

ORDNANCE EQUIPMENT DIVISION

Special Pneumatic Conveying Systems
High Efficiency Centrifugal Separators
Stationary and Portable Vacuum Cleaning Equipment
Process Equipment
Pneumatic Systems for Radioactive Materials

CHRYSLER'S
FORWARD LOOK
IN MATERIALS HANDLING

"Banty" Model A-460 Gas Tractor pulling train load of Mercury A-310 trailers.

CHRYSLER STREAMLINES HANDLING WITH

MERCURY

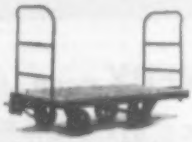
"TRACKLESS TRAINS"

"Tug" Model A-550 Electric Tractor

Chrysler Division's handling facilities call for mass movement of thousands of tons daily. Fast, dependable, economical hauling over long distances is a *must* in the Chrysler Jefferson plant, and the Mercury "Trackless Train" system provides the answer.

Flexibility is the number one advantage of "Trackless Train" operations. Loads are on wheels . . . readily movable by hand for short distances . . . motive power is free to perform other tasks.

Experienced material handling engineers from Mercury will be glad to furnish any data you desire. Consult the yellow pages of your phone directory. Write today for free literature on the Mercury "Trackless Train."



A-310 Trailer, Burden Carrier of the "Trackless Train."

"Banty" Model A-460 Gas Tractor hauling train load of Chrysler Motors.

MERCURY
FORK TRUCKS · TRACTORS · TRAILERS

MERCURY MANUFACTURING COMPANY
4110 South Halsted Street, Chicago 9, Illinois

FACTORY / CATALOG NEWS
Begins on page 158

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carloading, on copper slab miller, on bending roll, in paper mill. *Cleveland Worm & Gear Co.*

74—Roller Bearings. Cage, roller, and race that go into this line are described. Illustrates cage and roller, cage and race, race and roller combinations. Shows old and new designs. Charts life curve. 8 pages. Form SF-85. *Roller Bearing Co. of America.*

MISCELLANEOUS

75—Fire Equipment. 36 pages of information regarding fixed fire protection systems, portable and semi-portable equipment for combating various types of flammable liquid fires. Includes trucks. Engineering data; other useful facts. *American LaFrance Corp.*

76—Blueprint Filing. Case study on an active, efficient file of 50,000 production blueprints. Folder describes open shelf filing systems and procedures. Cites saving in floor space, filing time, speedier reference and refiling. Form CH-1030. *Remington Rand Div.*

77—Rubber Products. Catalog digest covers hose of all types, conveyor and elevator belts, transmission and V-belts, sheet packing, chute lining. Friction materials—90 items in all. Specifications and descriptions. Cutaway photos. 8 pages. *Thermoid Co.*

78—Silicones. Water repellents, oils and oil emulsions, electrical insulating resins, rubber gum stock and compounds, other useful silicones are listed in folder. Describes intermediates and silanes. *Linde Air Products Co.*

79—Industrial Equipment. Pocket-size catalog packs into 24 pages dozens of items ranging from work gloves to program timers. Includes cabinets; handling, shop, maintenance equipment. Form 3547. *General Industrial Co.*

Slow-moving shipments kept Joe in a pickle,
His sour disposition nothing could tickle . . .

But now he's all sweetness—the light just broke through.
Could swift **RAILWAY EXPRESS** be your answer, too?

The big difference is

Whether you're sending or receiving, whether your shipment is big or small, and whether it's moving by rail or air—you'll find it pays to specify Railway Express. It makes the big difference in speed, economy, and safe, sure delivery.

• • •

Railway Express uses the facilities of some 480 independent and competitive transportation companies in the movement of express traffic. It's free enterprise at its best, putting at your service one-third of a million miles of co-ordinated rail, air, water, and truck routes that connect all America.

RAILWAY EXPRESS AGENCY

. . . safe, swift, sure

HYDRA-Sweep

America's most modern industrial sweeper

with all these exclusive features—Adjustable sweeping width—30" to 61". Hydraulically propelled by single pedal which serves as forward and reverse, throttle and brake. Front-side brushes retract, automatically, upon striking an object. Constant broom speed *independent* of sweeper speed—0 to 8 M.P.H. Dirt hopper 10 cu. ft. Automatic hydraulic dump. 14 h.p. engine. Sweeping capacity 150,000 sq. ft. per hour. Can be used for towing.

INDUSTRIAL SWEEPER COMPANY
2508-18 S. MAIN • SOUTH BEND 23, INDIANA
EXPORT OFFICE: 44 WHITEHALL STREET, NEW YORK, N. Y.

Loosens FROZEN PARTS FAST!

Handy
Won't Leak
Shoots 3 Feet

Same formula as famous Kroil that has pleased 14,000 industrial users for 10 years or more.

Loosens stuck together metal parts, bushings, bearings, bolts, screws, pipe, etc., "anything from an embalmer's needle to a bulldozer," one customer said.

"Like an extra employee," said another. "Turned rust into mush, put $50,000 equipment back to work."

You too can get these results.

Try Aerokroil at our risk. Send $2 cash, and we'll pay postage.

12-OZ. CAN $2. F.O.B. NASHVILLE
CASE OF 12 $18.75

KANO LABS. 1067 S. Thompson Lane Nashville 11, Tenn.

Everybody talks about Quality

Quality Quality Quality Quality Quality

At "CHICAGO" we DO something about it!

- Metallurgical Control of raw materials
- Statistical quality control regulates all manufacturing operations
- Carbon restoration method of heat treatment eliminates decarb on heat treated products.

Chicago Screws will assemble faster, with fewer rejects, and with a measurable reduction in costs.

Progressive action plus better methods of manufacture have kept "Chicago" out in front for 83 years.

"Chicago" Products are carried in stock by your favorite service-conscious Industrial Supply Distributor. Call him today. He can serve you promptly from his complete stocks—whether it be a package or a carload.

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CHICAGO SCREWS

The CHICAGO SCREW COMPANY
ESTABLISHED 1872
2525 Washington Boulevard
Bellwood, Illinois

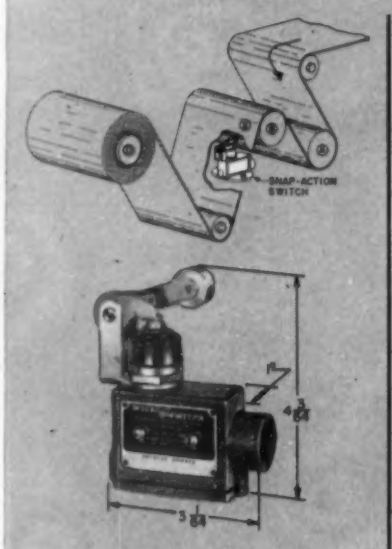
The complete Chicago "Safety Plus" line includes in alloy steel: Socket Set Screws • Socket Head Cap Screws • Socket Stripper Bolts • Square Head Dog Point Set Screws • Socket Pipe Plugs • Flat Head Socket Cap Screws • Dowel Pins • Hexagon Keys and Key Kits • Also Socket Set Screws and Socket Head Cap Screws in Stainless. The complete "Chicago" line of Standard Products includes: Hexagon Head Cap Screws in steel—bright and Grade 5, heat treated, also in brass and stainless • Square Head and Headless Set Screws • Taper Pins • Steel Studs Flat and Fillister Head Steel Cap Screws • Hexagon Nuts in steel, brass and stainless.

MICRO SWITCH Precision Switches
A PRINCIPLE OF GOOD DESIGN

Increase production and provide safety by adding MICRO SWITCH precision switches

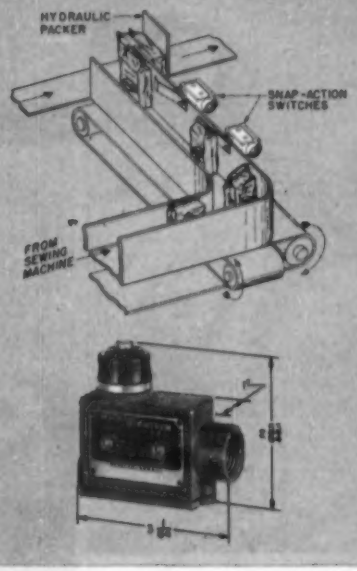
MICRO SWITCH precision switches are used by many progressive plant operators to make present equipment function more automatically, more rapidly and with greater protection to both operators and products. Result—increased production—a better product at a lower cost.

Here are three such ideas that illustrate the way MICRO SWITCH products are used to make equipment operate more efficiently.



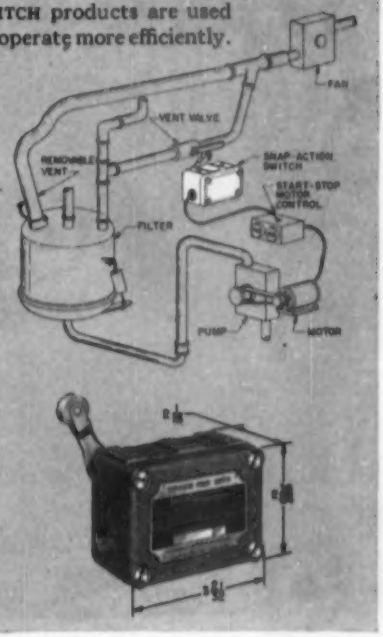
Assures tension on fabric shearing machine

• Fabric travels over rubber take-up rolls "A" and "B" to spreader roll "C" and on to batch roll "D". The batch roll is controlled by a slip-type take-up clutch. Tension is manually added as the roll builds up. If tension is not added soon enough, the fabric slacks at "X". The switch is mounted beneath take-up roll "B". When the slacked fabric starts to rewind, it actuates the switch which stops the machine and prevents damage.



Prevents jamming of feed conveyor

• Two switches installed on this feed conveyor prevent bags of sugar from piling up when the hydraulic packer jams. The switches are wired into the control circuit so that they operate independently as each bag passes. When bags pile up, both switches operate simultaneously, shutting off the conveyor. This ingenious arrangement prevents torn sugar bags and damage to sewing machines.



Explosion-proof switch protects personnel

• If the vent valve on this filter system is left open while the pump is running, a highly injurious chemical drains on to personnel working below. To make it impossible to start the pump motor with the vent valve open, an explosion-proof switch was wired to the motor control. Now the pump cannot be started unless the valve is closed. The explosion-proof switch is unaffected by hazardous atmospheres.

MICRO SWITCH products make plant equipment safer, more automatic and more productive. Look in the Yellow Pages for the name of the MICRO SWITCH distributor near you.

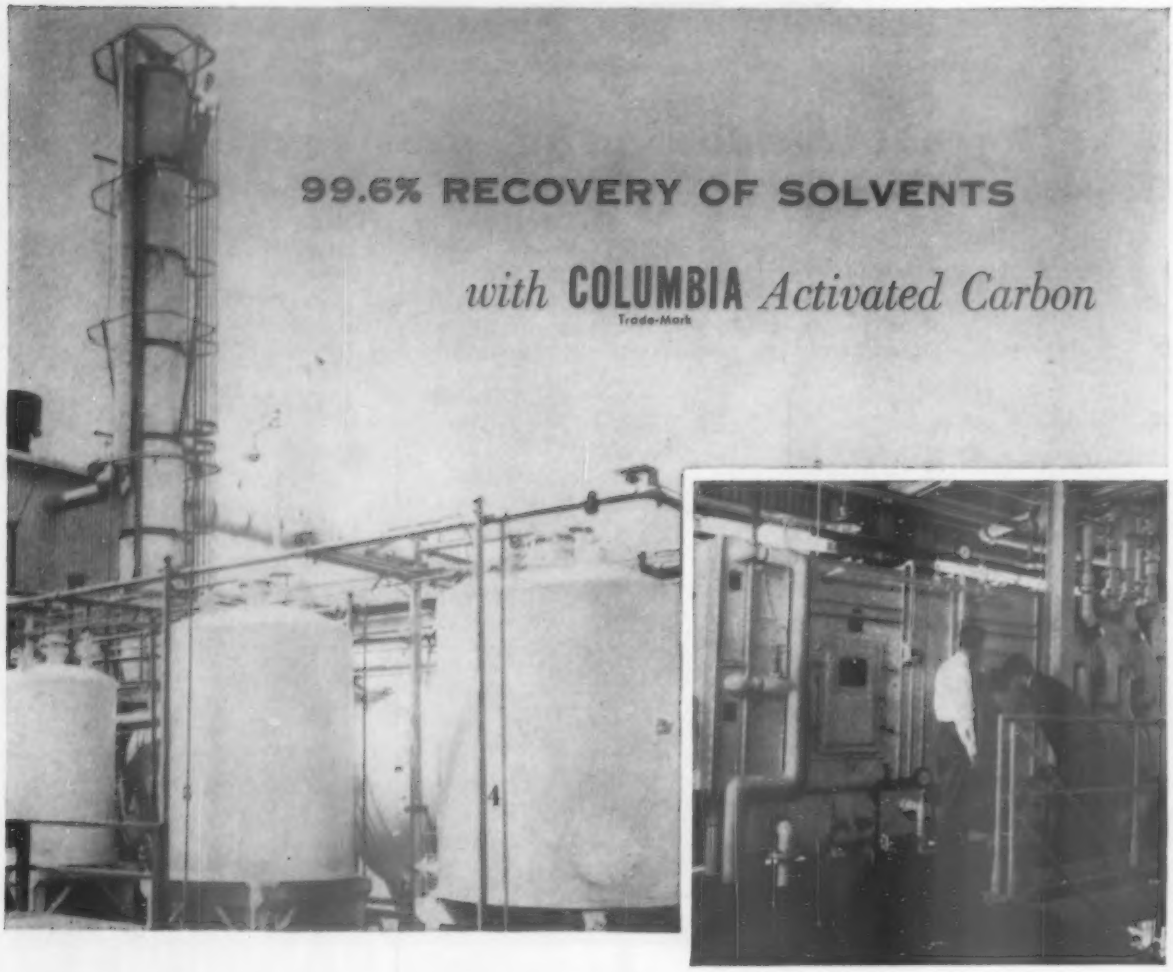
A complete line of snap-action and mercury switches

MICRO SWITCH provides a complete line of extremely reliable, small-size, high-capacity, snap-action precision switches and mercury switches. Available in a wide variety of sizes, shapes, weights, actuators and electrical characteristics. For all types of electrical controls.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS



Saves BAKELITE COMPANY $27,000 a month

This modern, CARBIDE-designed solvent recovery system in this plastics plant at Bound Brook, New Jersey, collects more than 600 pounds of solvent vapors an hour from the manufacture of BAKELITE vinyl cast film. It separates the solvents and delivers them ready for re-use—with a recovery plant efficiency of 99.6% and a cost of 1.5¢ per pound.

Two important features are behind this efficient, economical recovery. First, COLUMBIA Activated Carbon, with its long life and high adsorptive capacity for practically any low-boiling solvent. Second, the recovery plant, which was specially designed by CARBIDE's trained, experienced engineers to fit BAKELITE's recovery conditions.

All installations made by CARBIDE engineers are based upon careful surveys of the particular vaporization process. If the recovery problem is unusual, it is worked out on a pilot-plant scale. Then, the complete operating system is designed, supplied, and guaranteed by CARBIDE. Every recommended installation has paid for itself within a few years.

COLUMBIA Activated Carbon solvent recovery plants in use today save industry more than $150,000,000 a year by recovering over *two billion* pounds of solvents!

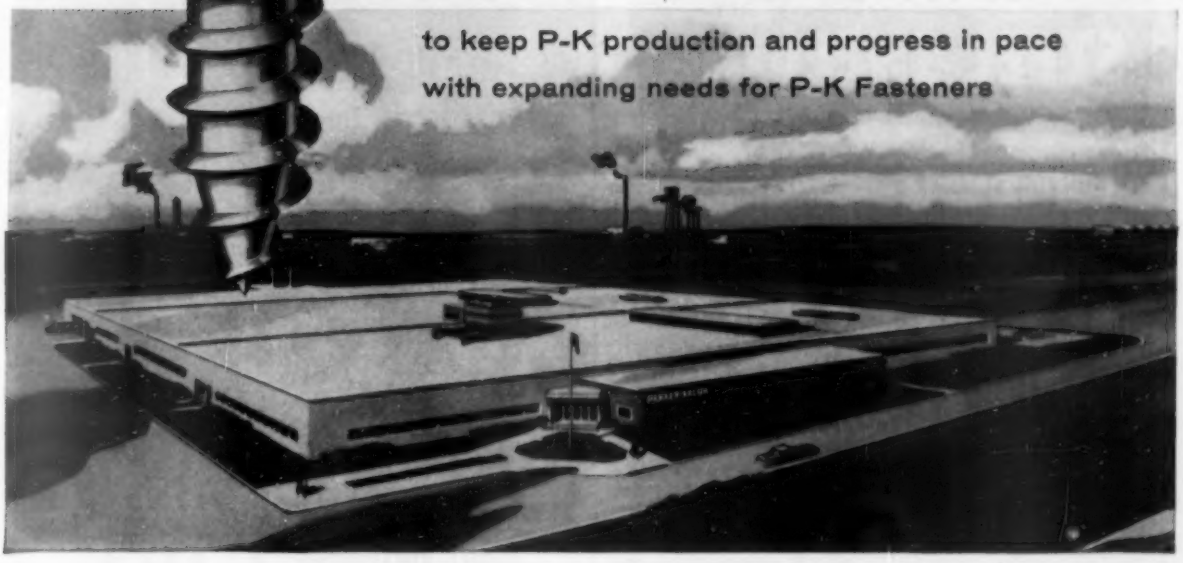
Write today for the booklet, "Solvent Recovery by the COLUMBIA Activated Carbon System" (Form 4410). In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Toronto.

CARBIDE AND CARBON CHEMICALS COLUMBIA Activated Carbon

Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

"Columbia" and "Bakelite" are registered trademarks of Union Carbide and Carbon Corporation.

a new plant for PARKER-KALON



In a few weeks, Parker-Kalon will move to its new plant in Clifton, New Jersey (about 10 miles from New York City). This modern building, containing 267,000 square feet on one floor, is one of the largest plants devoted exclusively to the manufacture of fasteners.

It is planned for the highest efficiency and economy in all operations, with production keyed to the steadily increasing demand for P-K Fasteners throughout industry. Advanced facilities for engineering and research will accelerate P-K progress in development of new and improved fasteners.

Now, more than ever, you can be sure . . . "If it's P-K . . . it's OK!"

PARKER-KALON DIVISION
General American Transportation Corporation
Clifton, New Jersey.

PARKER-KALON

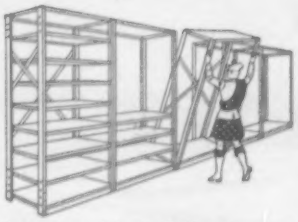
SELF-TAPPING SCREWS — STAPS — SOCKET SCREWS — SCREWNAILS — MASONRY NAILS — WING NUTS — THUMB SCREWS

Sold through leading Industrial Distributors

There's NO BETTER steel shelving value than

BORROUGHS STEEL SHELVING

* **Each individual unit is complete in itself** .. no part depends on unit next to it .. any unit or shelf can be moved independently.

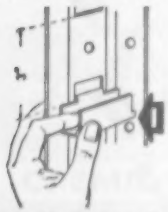


No steel shelving is easier or quicker to assemble. No bolts or nuts are needed to assemble shelves. Most practical and most flexible. Saves time and money from the first day of installation.

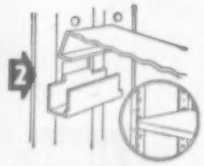
Portion of the Borroughs shelving installation at the warehouse-carpet section of the J. L. Hudson Co. department store, Detroit, Michigan. Open end assembly permits easy storage of rolled stock.

Borroughs double faced open shelving installation at Charles Scribner's Sons, Publishers, New York City. Note compact shelving arrangement—open face unit at ends requires minimum floor space.

another exclusive Borroughs feature!



Insert shelf support bracket . . **no fumbling with studs, bolts, nuts or lock washers.**



Tilt shelf into support bracket . . **and shelf is ready for loading.**

send for new 32-page catalog

BORROUGHS MANUFACTURING COMPANY

A Subsidiary of The American Metal Products Company of Detroit

3002 NORTH BURDICK amp KALAMAZOO, MICHIGAN

For "Traffic Volume—Minimum Maintenance—Minimum Closing Time"

install RUBBAIR DOORS!

Tileston and Hollingsworth Company, one of New England's oldest and most famous papermakers, wrote us a letter, saying in part—

"The doors were installed in our Machine Room, where traffic moves twenty-four hours a day, six days a week. Trucks are continually smashing into the doors, as rolls are moved from the paper machines into the finishing area. The doors have given almost trouble-free operation since installation. The Rubbair Door operates faster than any other we have used."

Rubbair Doors speed handling, reduce repairs, protect loads wherever doors must be hung in an industrial operation.

Check these advantages:

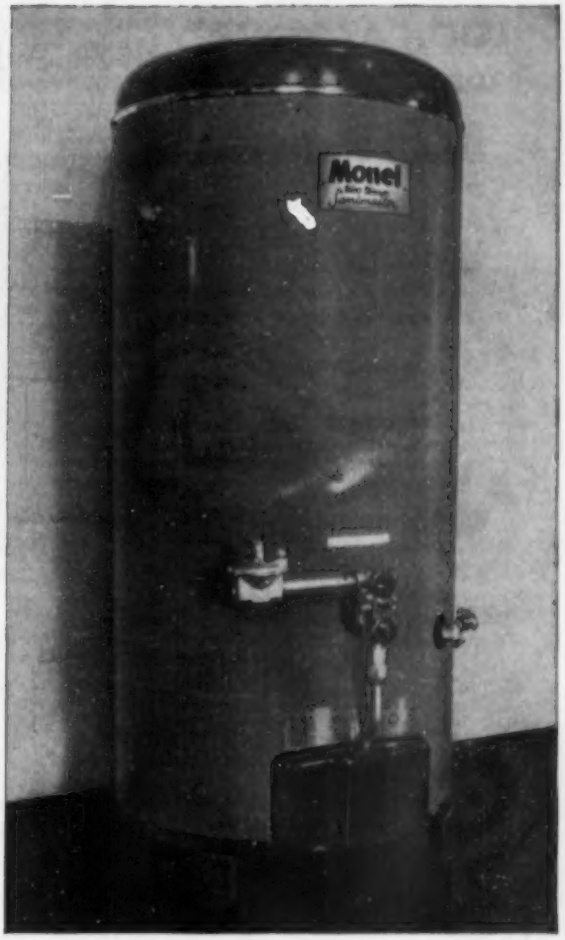
- **Improved insulation**
- **Reduced noise, industrial fatigue, injuries to personnel**
- **Protection from damage to trucks, pallets and loads**
- **Speedier handling of materials**
- **Greatly lowered maintenance costs**

For complete information write Dept. F.M.

Stic-Klip® **Rubbair Door Division MANUFACTURING CO., INC.**

50 Regent St., Cambridge 40, Mass.

Based on 50° cold water, the Sanimaster, as a single temperature unit, can deliver in one peak hour 263 gallons of mixed, general purpose 140° hot water. Meets all code requirements. Unit requires less than 1 sq. yd. . . . can be used in multiples. One man installation.



Ruud-Monel and Crane-Monel two-temp Sanimaster 80-80 provides low maintenance through simplified controls. Operates on all gases. Available only from Ruud Manufacturing Company and Crane Co.

For { rust-free hot water . . . two-temperature supply . . . constant 180° sanitizing rinse . . . easy installation . . . low maintenance . . . great, wear-resisting strength . . .

be sure the Monel label is on the water heater you specify

You get no rust from these modern Sanimaster gas water heaters. Their tanks are solid MONEL®.

But your plant does get plenty of sparkling clean hot water . . . at the two temperatures it needs. An unrestricted flow of 180° *sanitizing* hot water for dish-washers and industrial uses. 140° *regular* hot water for showers, Bradley wash fountains, sinks and lavatories. Both temperatures from the same tank, at the same time.

Strong, wear-resistant MONEL . . . the solid, high-nickel, long-life metal tank . . . is highly corrosion-resistant and rust-proof at *all* temperatures.

The Sanimaster is an automatic self-contained gas water heater, without coils. It carries the A.G.A. seal of approval for operation at 180°. An A.S.M.E. relief valve is standard equipment.

Be sure to specify either the Ruud-Monel or Crane-Monel *two-temp* Sanimaster. Send in the coupon . . . for details.

THE INTERNATIONAL NICKEL COMPANY, INC.
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Please send detailed information on Monel Sanimaster Automatic Gas Water Heaters.

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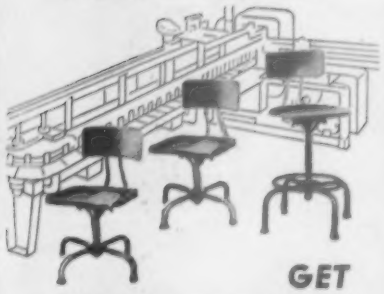
LOOK AT YOUR PRODUCTION LINES!!!

Need Chairs?



GET AJUSTRITE CHAIRS and STOOLS

It has been proven time and again that much of the burden of fatigue depends on the posture of the worker. Ajustrite Chairs and Stools minimize fatigue and increase efficiency by providing proper seating posture.

Instantly Adjustable to Meet Individual Requirements

Ajustrite Chairs and Stools enable the worker to instantly adjust the height of the seat, up or down, to suit his individual requirements for correct, comfortable seating posture. No tools are required, no bolts, nuts or screws to loosen, or adjust. User merely lifts the seat to the desired height—the seat holds securely at the point where uplift stops.

MORE THAN 32 MODELS

AJUSTRITE Offers a Wide Choice of Stools and Chairs for Every Requirement.

Posture chair with seat adjustment of 16 to 21 inches. Backrest horizontal and vertical adjustment of 5 inches.

TSC-1520

The New Idea in Seating for Stand-Up Jobs

SIT—STAND or LEAN Platform Stool. New 4 Position Tilt-Seat Stool and Platform with adjustable foot rest plate. Relieves fatigue, increases efficiency, cuts absenteeism, affords long needed relief to the 'stand-up' job problem.

FREE TRIAL

Samples of any standard Ajustrite model furnished for 30 day trial. Send for illustrated folder today.

AUTOMATIC ADJUSTMENT to Any Height Desired

AJUSTO EQUIPMENT CO.
2148 MADISON AVE. • TOLEDO 2, O.

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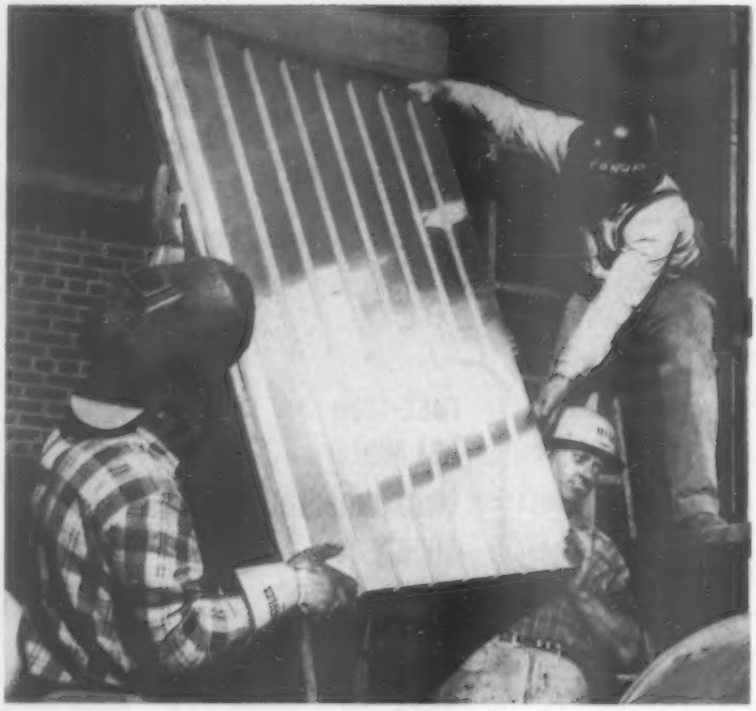


THIN SHEETS OF STAINLESS, cleverly shaped, make strong curtain-wall panels. Quickly erected or removed, they meet today's need for expandable-plant construction.

Maintenance-Free Metal Walls

Economical use of stainless steel for building walls becomes more feasible with new construction tricks

How to use wall-panel sections to change exterior plant construction is shown in a major study by researchers at Princeton University. A further report now gives you an engineering basis for solving metal-wall construction problems.

Shows how the characteristic strength, wearability, and chemical-corrosion resistance of stainless can be achieved more economically. Metals can be backed with asbestos fire wall or lightweight concrete.

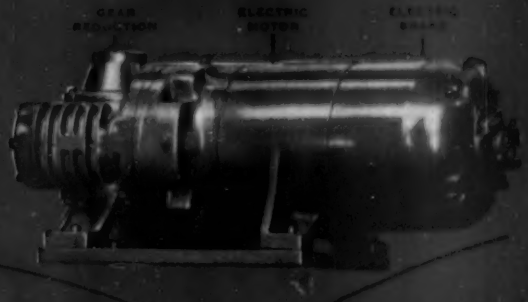
Dramatic color effects can now be achieved by applying porcelain enamel to textured patterns in stainless, letting metallic high spots shine through.

Committee of Stainless Steel Producers, American Iron and Steel Institute. (Circle No. 1, Reader Service Card.)

Spread and Form Metals Like Putty

Metals supplied in paste form are useful for industrial design, repair, or maintenance. These two aluminum compounds are easily applied and cold-worked by hand. They air-harden to strong, rustproof, long-wearing metals that can be machined and finished like the base metal. (See items 2 and 3 on next page.)

Turn the page

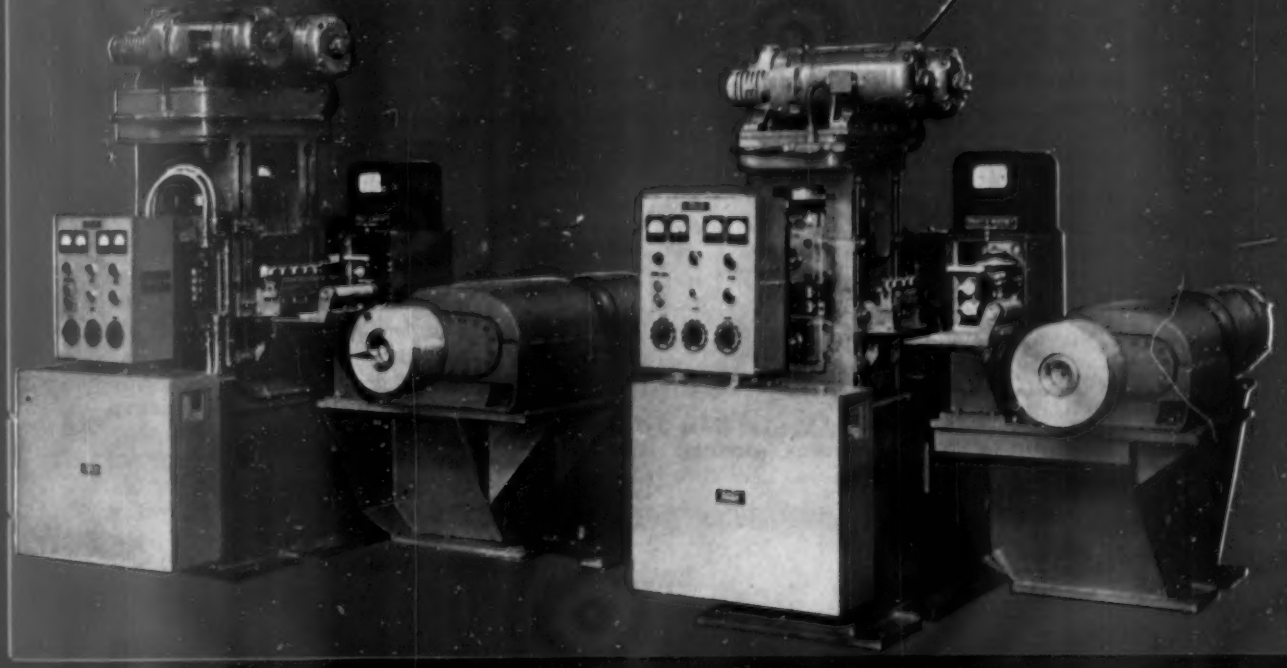


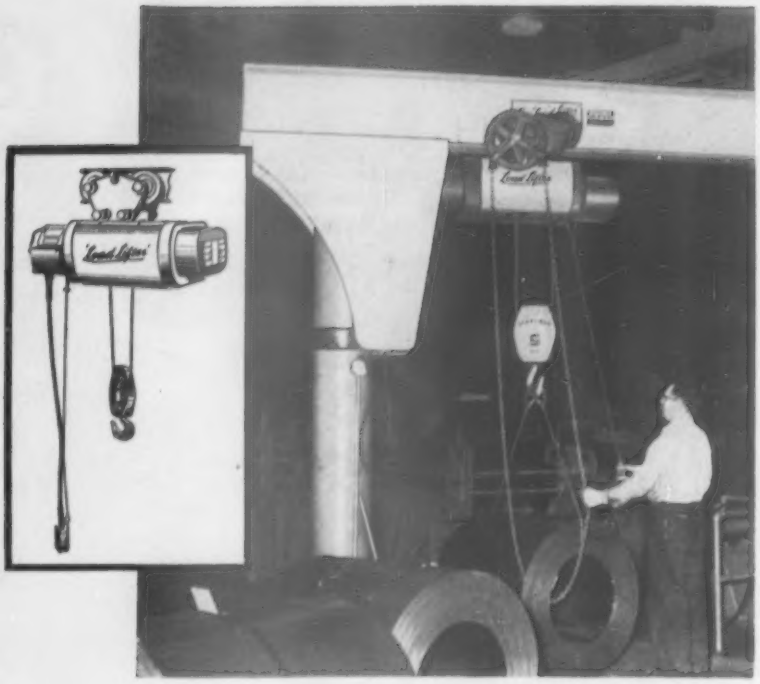
See how easily the standard electric motor, standard gear reduction, standard electric brake combine into a drive that gives the RIGHT horsepower, the RIGHT shaft speed, the RIGHT features . . . all in one compact unit. Nowhere else will you find power units that are so flexible, so easily adaptable, and in such a wide range of types and ratings.

Master power drives are available in thousands and thousands of ratings (⅛ to 400 HP) . . . in open, enclosed, splash proof, fan cooled, explosion proof . . . horizontal or vertical . . . for all phases, voltages and frequencies . . . in single speed, multi-speed and variable speed types . . . with or without flanges or other special features . . . with 5 types of gear reduction up to 430 to 1 ratio . . . with electric brakes . . . with fluid-drive . . . with mechanical or electronic variable speed units . . . and for every type of mounting . . . Master has them all and so can be completely impartial in helping you select the one best power drive for you.

standard units easily combine into special purpose drives

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO





WANT LOWER COSTS? THEN USE THIS HOIST!

Step up load handling speed in your plant and save money doing it. Put the Series "700" 'Load Lifter' Electric Hoist to work. It shortens hoisting time—lifts a 1-ton load a foot in only 2 seconds! You get more lifts per hour.

The Series "700" 'Load Lifter' is a push-button work-saver, safety-engineered to protect man, load and hoist. Only 24 volts at the pendant control! The powerful load and motor brakes are synchronized; each alone can hold the full load. Steel suspension and overcapacity load hook, plus preformed nonrotating wire rope, provide super-strength.

The Series "700" 'Load Lifter' has few parts—trouble-free performance assured! There's extra durability in the heat-treated helical gearing; extra-smooth operation because ball bearings are used throughout. Capacities from ½ ton up. Single and two-speed control and all types of suspension available.

Let the nearby "Shaw-Box" Distributor show how this rugged hoist can cut your load handling costs. Or write direct for Bulletin 410.

'Load Lifter'® ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' and 'American-Microsen' Industrial Instruments, and Aircraft Products.

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Begins on page 298

For more about these products, circle item numbers on Reader Service card next to back cover.

2—Sculp-Metal is ready to use as it comes from the can without mixing or catalyst. When dry, it will not crack, chip, check, peel, or corrode. Withstands temperatures from –65 to plus 350 degrees F. Can also be thinned and sprayed like paint over fiberboard, leather, canvas, etc. *Sculp-Metal Co.*

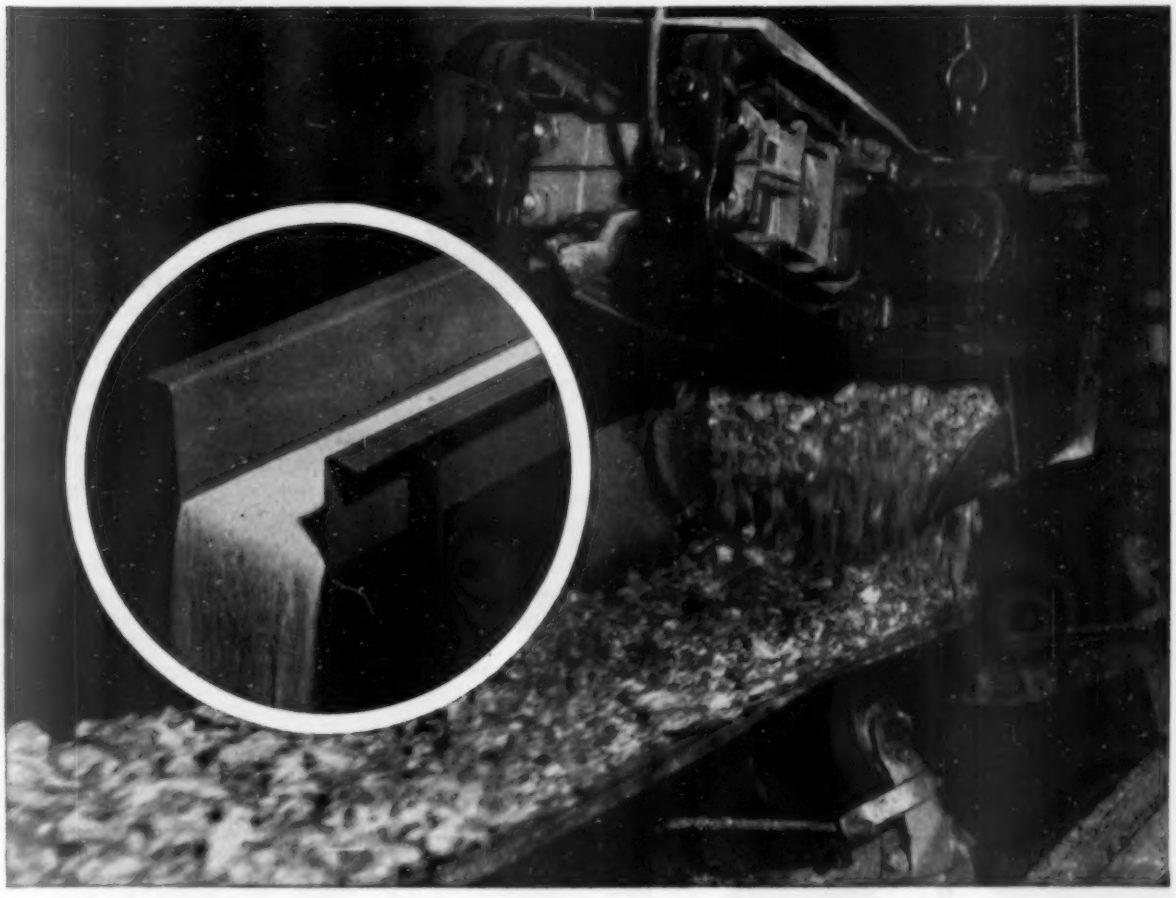
3—Lab-Metal is a repair material that forms a permanent waterproof, metallized surface on metal, wood, glass, etc. This "improved" cold metal solder does not require heat or mixing. Spreads easily with a putty knife. Has tensile strength of 650 psi. And it's unaffected by mild acids and solvents. *Alvin Products.*

4—Aluminum Tile has real ceramic coating fired to it. Has glass-hard surface finish which cleans quickly and easily. Highly resistant to chemicals. Damage-free in heavy duty. Can be cut and bent to fit and will not chip or craze. So light that tile and mastic together weigh less than 18 oz. per sq. ft. *Vikon Tile Corp.*

5—Vinyl Foam can be formulated to provide a wide range of density-hardness ratios. Resulting flexibility of product makes it suitable for a variety of foam applications. *Monsanto Chemical Co.*

6—Hardfacing Paste, applied without special skill, can impart high hardness and abrasion resistance to metals. After fusing with heat to metals (with melting point above 1850 F.), surface hardness rises to 55-61 on the Rockwell C scale. Hi-C 60 "Ruf-Nek" paste is available in tubes and jars. *Superweld Corp.*

7—Package Cushioning of Fiberglas meets military specifications. Available for industrial use, too. Protects delicate instruments and machinery, fragile and expensive items. Comes in wide range of densities up to 30 lbs. per cu. ft. Highly resilient, dimensionally stable, unaffected by changes in temperature or humidity. Comes in various thicknesses



Jeffrey puts VIBRATION to useful work

You can solve many problems of conveying solid materials with Jeffrey Electric Vibrating Feeders. Move fine powders or huge stone blocks . . . a few ounces or two thousand tons per hour . . . dripping wet or bone dry . . . at temperatures ranging from 30° below zero to 2,000° above. Materials are propelled in a smooth, continuous stream by each forward vibration stroke.

Balanced vibration in the Jeffrey system matches electrical frequency to natural mechanical frequency of the driven equipment. This makes the system highly economical to operate, since all available energy does useful work. It is easy to control, safe, quiet and dependable. Vibration is scientifically isolated within the conveyor.

Jeffrey's years of experience with conveying problems enable us to furnish systems exactly right for each particular task. Catalog 870 describes the complete line of Jeffrey Vibrating Equipment. For a copy, and for help on your conveying problems, write The Jeffrey Manufacturing Co., Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Bucket Operating Equipment for HANDLING BULK MATERIALS

This monorail hoist is especially adapted for moving bulk materials from cars to storage piles or coal hoppers and for "spotting" material at various points where required. The operator has a clear view ahead as he rides in a cab designed for inside and outside use.

Euclid Cranes are also available in a range of sizes and capacities equipped for hook operation, with magnet or bucket to handle bulk materials over a wide area.

Write for the new Euclid catalog, outlining your requirements if possible. A recommendation will then be made without obligating you in the least.

Euclid Cranes

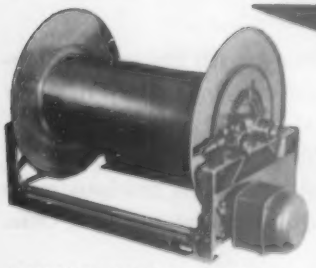
The EUCLID CRANE & HOIST Co.
1364 CHARDON ROAD
CLEVELAND 17, OHIO

IF YOU USE HOSE....

for—
Chemical Processing
Vehicle Fueling
Fire Fighting
Cleaning
Production
and
wherever
hose
is used!

Hundreds of standard types and sizes. Also, custom built to your specifications

Save time!
Speed production!
Improve safety!
Save hose!
Stop waste!
with



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HANNAY HOSE REELS
CLIFFORD B. HANNAY & SON, Inc.
WESTERLO, NEW YORK

Send me complete details on Hannay Hose Reels to be used for _____

Name _____
Company _____
Address _____

CLIFFORD B. HANNAY & SON, INC.
83F Main St.
Westerlo, N. Y.

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Begins on page 298

For more about these products, circle item numbers on Reader Service card next to back page.

in sheets or rolls. *Owens-Corning Fiberglas Corp.*

8—Flame-Resistant Paint has been developed to protect wood fiber insulation boards. Non-burning ingredients of this finish should eliminate the danger of flash fires and rapid fire spread, according to maker. Permits interior fiber board construction in buildings where flame resistance is of paramount importance. *National Gypsum Co.*

9—Liquid Plastic repairs irregularities in molded plastic cases and other products. Alfil is transparent, quick-setting, gives waterproof seam. Apply with brush or applicator. *Allen Plastics Corp.*

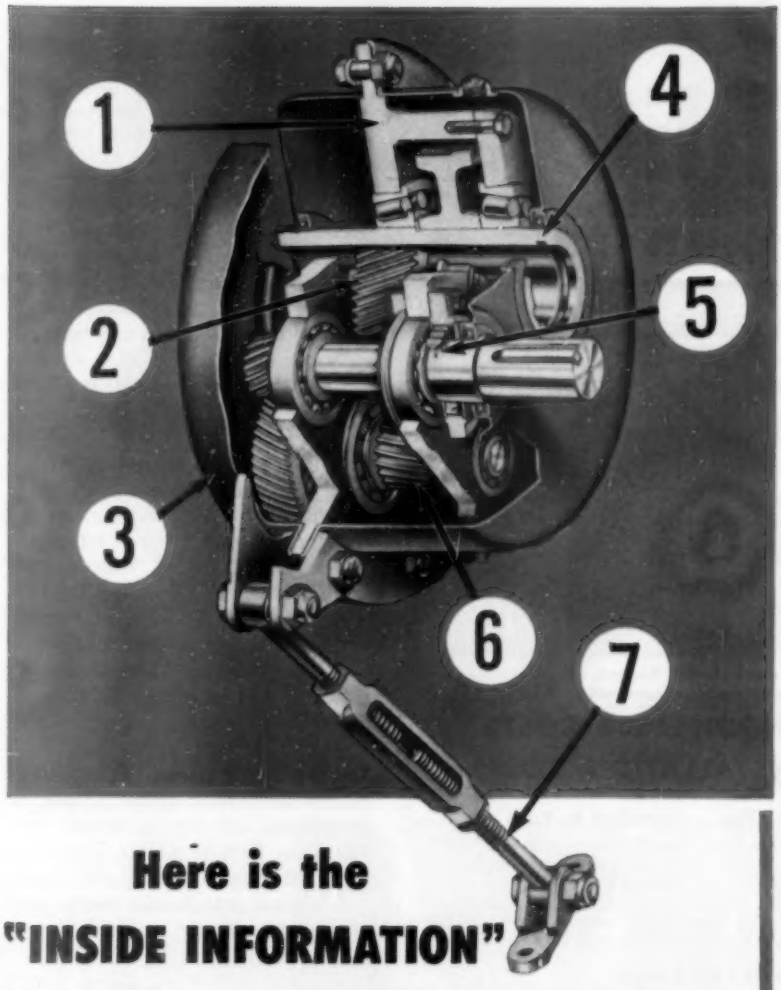
10—Monolube is a motor conditioner to clean, lubricate, and repower internal combustion engines. Recommended for use after each oil change or chassis lubrication. Can be poured in combustion chamber, crankcase, gasoline tank. Reduces engine friction and heat, restores lost compression and power, increases service life. *Revere Chemical Corp.*

11—Coil Wrapping Material is a new polyester fabric in non-woven, felted form. "Scotch" web offers increased moisture resistance, superior varnish "pickup," and conforms readily to shape of coil. *Minnesota Mining and Mfg. Co.*

12—Porcelainized Aluminum Foil comes in wide range of matte and glossy colors. Foil as thin as 0.0005 in. can be processed. Useful for laminating onto low-cost backing materials—plywood, fiber board, etc. *General Ceramics Corp.*

13—High-Denier Yarn is super strong. The 1600-denier Fortison-36 was developed for the mechanical rubber goods industry—for fire hose, V-belts, conveyor belts. For applications needing great strength, low stretch, dimensional stability. *Celanese Corp. of America.*

Turn the page



Here is the "INSIDE INFORMATION" on FALK ALL-STEEL Shaft Mounted Drives

Take a careful look inside the Falk all-steel Shaft Mounted Drive, and you will know why this newest member of the famous Falk family is ideal for applications where direct mounting on the driven shaft is desirable. It is the only drive in its field with all these superior "In-built" factors:—

1 **All-steel Frame,** with more than double the rigidity of iron, supports all rotating elements.

2 **Precision Helical Gears,** designed and machined by Falk, rated to AGMA standards.

3 **Pressed Steel Housings,** whose sole function is to keep oil in, dirt out; easily removed for gear inspection without dismounting unit.

4 **Through Hollow Shaft** with counter bore provides for easiest installation or removal from driven machine shaft extensions.

5 **Backstop** can be furnished with the unit or added later for positive prevention of reverse rotation.

6 **Positive Lubrication,** continuous direct dip of revolving elements at all speeds.

7 **Tie Rod** and turnbuckle serve as anchor and facilitate V-belt or chain adjustment.

Write to Department 247 for engineering bulletin, including selection and dimension details.

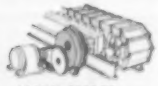
EFFICIENT SPEED REDUCTION IN LIMITED SPACE

SIX SIZES

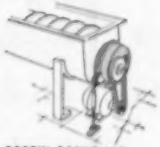
- 1/2 to 30 hp
- Single or double reduction
- Wide output speed range—420 to 10 rpm

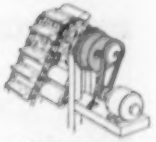
Expressly designed for topflight performance on installations requiring considerable speed reduction in limited space, the all-steel FALK Shaft Mounted Drive has quickly won acceptance throughout industry. This sturdy, compact, versatile reducing unit is an ingenious variation of the highly successful FALK Motoreducer design, pacemaker in its field for more than 20 years. Here, the time-proved design is adapted for mounting directly on the shaft to be driven, using V-belt connection to motor. Investigate now!

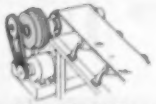
A FEW TYPICAL APPLICATIONS

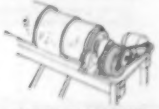

APRON FEEDER

LINE SHAFTING


SCREW CONVEYOR


BUCKET ELEVATOR


BELT CONVEYOR


GRAVEL CLASSIFIER

THE FALK CORPORATION, Milwaukee 8, Wisconsin

MANUFACTURERS OF

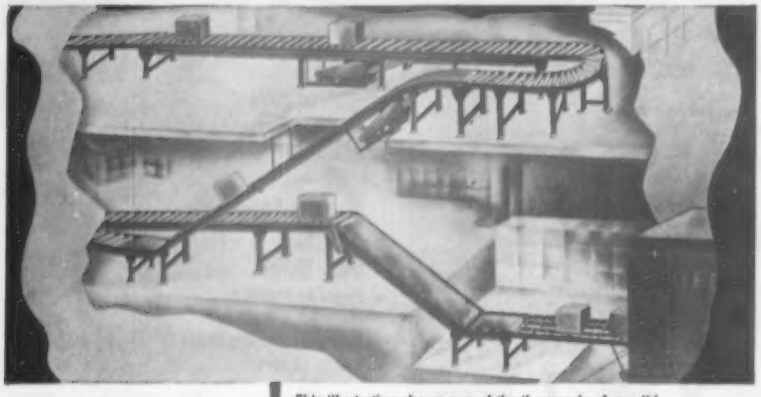
- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

...a good name in industry

THE NEW LAMSON ERECTO

conveyor units

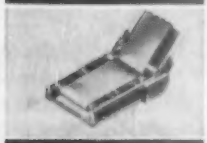


This illustration shows one of the thousands of possible combinations using Lamson Pre-Engineered Conveyor Units.

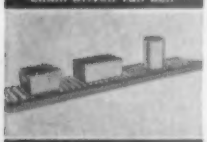
SAVE YOU ENGINEERING COSTS INSTALLATION COSTS

For Every Type of Layout Lamson offers 4 types of Pre-Engineered Conveyor Units: Roller Gravity, Wheel Gravity, Belt and Live Roll Conveyors.

Center Drive



Chain Driven Tail Belt



Roller Gravity Conveyor

Designed By You . . . Installed By You!

You can combine Lamson Erecto Conveyor Units into whatever type of system your materials handling requires. Your Lamson Dealer will help you plan a Lamson Erecto Conveyor system tailored to your plant layout. Your regular personnel can install Lamson Erecto Conveyor Units with ordinary tools.

As Flexible As Your Future!

You can quickly adapt to new conditions in materials handling by relocating the units . . . by expanding or shortening the system. The flexibility of Lamson Erecto Conveyor Units allows you to plan your present system with an eye toward future expansion. All parts are standardized for easy addition or replacement.

Ruggedly Constructed!

Lamson Erecto Conveyor Units are built of precision-balanced rolls, formed steel channel supports and tough, sturdy frames. Lamson Erecto Conveyor Units are designed for long-lasting life. They provide fast, efficient flow of materials at greatly reduced costs.

Speedy Delivery!

Your Lamson Erecto Conveyor Units arrive on the job shortly after your order has been placed.

Write today for your free booklet which shows how you can save engineering and installation costs and time . . . with Lamson Erecto Conveyor Units. MAIL THIS COUPON TODAY!

LAMSON 75th YEAR

Inquiries by interested dealers are invited.

Lamson Corporation,
5231 Lamson Street, Syracuse, New York
Gentlemen: Please send me a free copy of your booklet describing Lamson Erecto Conveyor Units.

NAME ..... TITLE .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

FACTORY / MATERIALS NEWS
Begins on page 298

For more about these products, circle item numbers on Reader Service card next to back cover.

14—Cleansing Solvent is safe for most industrial applications. Has cleaning properties closely resembling carbon tetrachloride, but with 1/20th the toxicity. Heavy, more effective concentrations can be used without exposing workers to danger. C-I-Sol is also non-flammable. *Chem Industries Co.*

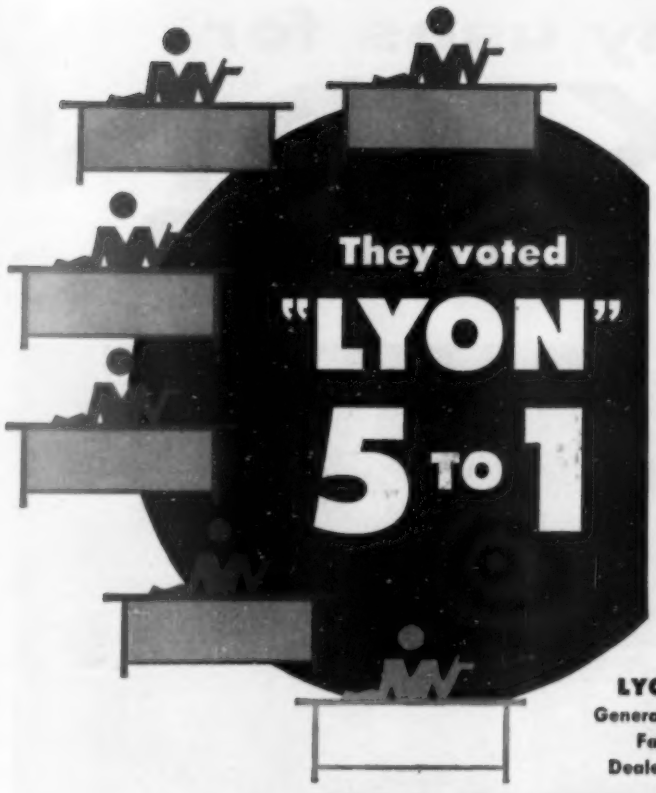
15—Lightweight Structural Material can be made into many products, including roof deck and core material for fireproof doors and partitions. Material called "Calsi-Crete" was developed as a building block—now useful for other structural items. Potential uses include insulation, packaging, furnace liners, acoustical tile, and various others. *Jackson & Church Co.*

16—Spray Washing Compounds permit mechanical spray cleaning of ferrous and non-ferrous metals. No. 58 cleans ferrous metals, removing any hard water scale. No. 59 cleans non-ferrous metals like brass and aluminum, without etching or tarnish. *Detrex Corp.*

17—Cold Finish for Aluminum is a one-minute process with Alumblack. With it, aluminum dries to a dull-gloss finish—and is easily rubbed to achieve a high-gloss, satin-smooth appearance. It's recommended for finishing small parts and retouching. Parts can be dipped, sprayed, coated by rag or brush, as desired. *Birchwood Chemical Co.*

18—Steam Cleaning Compound for relatively soft water is economical to use. Developed to take advantage of water with less than 10 grains in hardness. Includes less of the costly chemical water conditioners used in company's other types. *Clayton Mfg. Co.*

19—Fungus-Resistant Tubing is made of vinyl plastic. Temflex 105 is approved by Underwriters' Laboratories for continuous operation at 105 C. of electrical and electronic equipment. *Irvington Div. of Minnesota Mining & Mfg. Co.*



It's Lyon by a landslide in a recent preference survey among executives in companies throughout the country. They gave Lyon five times more first choice mentions than the second highest manufacturer . . . and twice as many as the next twelve combined!

A nationally known research company compiled those figures by asking key men in 5,000 companies this question:

"If your company were in the market for steel equipment such as steel shelving, lockers, work benches, shop boxes, etc., what manufacturers would you consider?"

Your nearest Lyon Dealer offers the world's most diversified and most preferred line of quality steel equipment. (A few items are shown below.) Equally important, he can show you how to get the most out of steel equipment in terms of time, space and money.

LYON METAL PRODUCTS, INC.
General Offices: 1112 Monroe Ave., Aurora, Ill.
Factories in Aurora, Ill. and York, Pa.
Dealers and Branches in All Principal Cities

Lyon also has complete facilities for manufacturing special items to your specifications.

LYON®

STEEL EQUIPMENT

for BUSINESS • INDUSTRY • INSTITUTIONS
also STEEL KITCHENS for THE HOME

A PARTIAL LIST OF LYON STANDARD PRODUCTS

• Shelving	• Kitchen Cabinets	• Tool Toters	• New Freedom Kitchens	• Flat Drawer Files	• Folding Chairs	• Service Carts	• Tool Stands
• Lockers	• Cabinet Benches	• Bar Racks	• Display Equipment	• Revolving Bins	• Coat Racks	• Sorting Files	• Shop Boxes
• Stools	• Storage Cabinets	• Tool Boxes	• Toolroom Equipment	• Filing Cabinets	• Work Benches	• Drawer Units	• Tool Trays
• Bin Units	• Drawing Tables	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks

how many uses for DEXION in your plant?

RACK

DINING TABLES

STORAGE

DIE RACKS

TABLE AND BINS

FILING TABLE

Easy to cut. One stroke of DEXION cutter saves time.

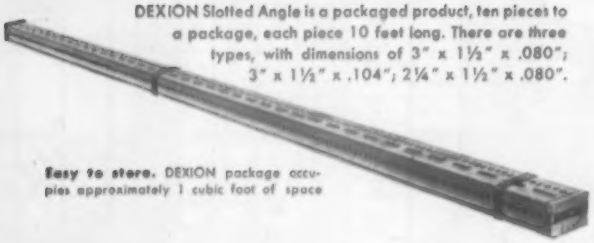
Simple to connect. Use only two wrenches.

DEXION panels. For shelving to support heavy loads.

Re-useable. Dismantle—rebuild into other equipment.

Here's why you'll want DEXION Slotted Angle over any other framing material

Only your imagination limits the applications of this ingenious slotted angle framing material. Users discover that they can build whatever they need—when they need it—and build it cheaper! Easily dismantled, DEXION Slotted Angle can be reused in new ways to meet changing needs. There's no waste! And anyone who can use a wrench and a saw (or DEXION cutter) can build with this precision-made slotted angle.



DEXION Slotted Angle is a packaged product, ten pieces to a package, each piece 10 feet long. There are three types, with dimensions of 3" x 1½" x .080"; 3" x 1½" x .104"; 2¼" x 1½" x .080".

Easy to store. DEXION package occupies approximately 1 cubic foot of space

GET the exciting new
DEXION IDEA BROCHURE,
which gives you full information. Write direct to the address shown below, Dept. 11A.

DEXION DIVISION

ACME STEEL COMPANY

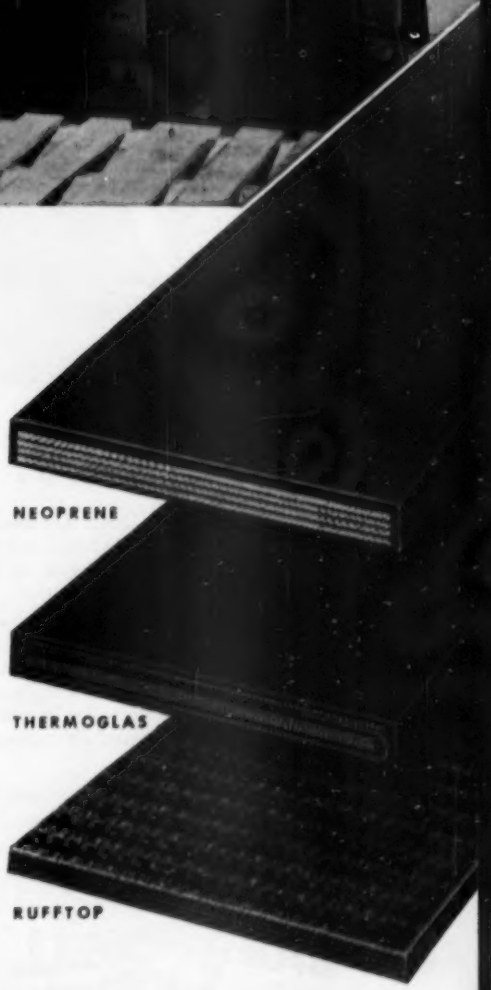
2840 ARCHER AVENUE, CHICAGO 8, ILLINOIS

ACME STEEL

Thermoid Conveyor Belting cuts your handling costs

There's a Thermoid Conveyor Belt designed to lower your costs on every type of materials handling job. Each is best suited for the particular type of service recommended. Here are 3 selected from the complete Thermoid line: NEOPRENE —built especially for conditions where heat and oil are encountered; THERMOGLAS — designed for use where belt is exposed to temperatures of 275° to 350° F.; RUFFTOP —Thousands of irregular gripper points guide smooth surfaced articles up inclines to 35°.

Thermoid's exclusive impregnation process welds carcass and cover into an exceptionally strong, durable belt. Finest quality reinforcement and specially compounded rubber stocks assure long life, less down time, lower handling costs. Your Thermoid Distributor carries a full line of Thermoid Conveyor Belting, Hose and Multi-V Belts to meet your most exacting requirements. He maintains complete stocks and can give you fast service. If you prefer, write direct.



Thermoid

Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

Rubber Sheet Packings • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

Some sprinkler systems don't *say* anything. They work quietly, but they don't *sound an alarm at the Municipal Fire Department.*

If your sprinkler system is not arranged to call the Fire Department automatically, it will pay you to get the facts from a Gamewell engineer. He will show you how the Gamewell Sprinkler Watchman will make your sprinkler system *heard* at the fire station.

Write today for the facts.

THE GAMEWELL COMPANY
Chestnut St., Newton Upper Falls 64, Mass.

GAMEWELL
FIRE ALARM SYSTEMS
SAFETY ENGINEERED FOR YOUR PROTECTION

FACTORY | NEW BOOKS

An Introduction to Automatic Computers—This is one of the few books offering practical advice on the application of computers to business. Tells you what a computer is, what it can—and cannot—do, and how to fit a computer into your company operations. Includes sections on cost and financial justification of computers, how to evaluate their profitability in your application, how to tie them into your business systems, and management science. There's also a rather technical section on how computers work, including the rudiments of programming. This is a down-to-earth treatment of a highly complex and often misunderstood subject. Will help you answer the one basic question: "Can our company profitably use a computer?" *By Ned Chapin. For copy, write Chapin, 407-K Gunsaulus Hall, 3140 S. Michigan Ave., Chicago 16, 245 pages. $9.*

What Is Operations Research Accomplishing in Industry?—Proceedings of a conference held earlier this year. Contains detailed, easy-to-follow case studies of actual industrial applications. Several are examples of effective solutions to complex production-scheduling and inventory-control problems. Extensive survey and review of accomplishments show the nature of operations research work in industry. Lists the companies using operations research, tells how they're using it. Also includes a review of what management thinks of it. *Operations Research Group, Case Institute of Technology, Cleveland. 102 pp. $5.*

Problems and Control of Air Pollution—Those who have worked with the problem of air pollution, and have a good basic knowledge of it, should find this book helpful. Not for the beginner in the subject. It's the proceedings of the First International Congress on Air Pollution, held in March 1955 under the sponsorship of the ASME. Papers fill the gaps in available knowledge on air pollution, current developments, sulfur dioxide treatment and recovery, experience in air pollution abroad. *Edited by Frederick S. Mallette. Reinhold Publishing Corp., 430 Park Ave., New York 22. 269 pages. $7.50.*

Industrial Lubrication Practice—This is a guide to sound lubricating practice. Should prove useful to anyone responsible for the efficient and trouble-free operation of machinery, mechanical equipment, and the prime movers. Easy to read and understand. Describes lubrication of all types of bearings, types of lubricants and their uses, methods of lubricant supply, storage and handling of lubricants, lubrication of all major classes of equipment, and so on. *By Paul D. Hobson. The Industrial Press, 93 Worth St., New York 13. $8.*

Management Training—Training directors will find this book interesting and useful. It consists of 264 case studies designed to train supervisors; plus an outline of the principles of management involved in solving each case properly. There are case studies on management's job, organization, policies and rules, chain of command, communication, departmental planning, methods improvement, work performance, evaluating employees, human relations, fitting men and jobs, induction and training, many other important supervisory responsibilities. *By William J. McLarney. Richard D. Irwin, Inc., Homewood, Ill. 371 pages. $5.50.*

Connecting and Testing Direct-Current Machines—Time- and trouble-saving methods of connecting and testing d-c motors and generators are the subject of this book. Electrical engineers, maintenance men, and repair-shop workers will find it a useful aid in completing such jobs as re-connecting d-c motors and generators for voltages and speeds other than those for which they were built, locating and correcting faults, changing a series type into a shunt machine or vice versa, converting a d-c generator into a motor or vice-versa; and the like. This third edition includes completely new ma-

STANDARD *technical service clicks at Argus Camera*

Personnel at Argus Camera Company were having trouble with the grinding of thread plug gauges. Grinding oils used failed to hold the required accuracy. They called in L. H. Walker, Standard Oil industrial lubrication specialist. He recommended Standard's SUPERLA Thread Grinding Oil A, and Argus began using it. That was four years ago. What happened? SUPERLA Thread Grinding Oil has helped Argus grind thread plug gauges with such accuracy, so consistently, that rejects are virtually eliminated.

Small job? Yes. Small volume of oil used? Yes. But the results are big business to Argus Camera. That makes it important to Standard Oil. It is another demonstration of what this unbeatable combination can do when put to work:

1 Standard lubrication specialists capable of giving technical help.

2 Top quality products *that deliver results required.*

Put this combination to work in your plant. In the Midwest there is a lubrication specialist in your nearby Standard Oil office ready to help you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Omer L. Parks (left), tool and gauge grinder for Argus Camera, inspects thread plug gauge with L. H. Walker, Standard Oil industrial engineer. Lyman Walker has been working with customers for 25 years helping them solve problems like the one at Argus. A native of Detroit, Lyman Walker is familiar with the lubrication problems of industry in the territory he serves. This together with his wide experience makes him ideally qualified for this work. Customers find his experience pays off for them.

STANDARD

STANDARD OIL COMPANY
(Indiana)

Here's Lift Power that Lowers Costs!

SIMPLEX JACKS

Engineered to deliver maximum power at minimum weight, Simplex Hydraulic Jacks meet every jacking need with ease, safety and dependability. Eight models, in capacities from 3 to 100 tons, Sold *only* through Industrial Distributors.

Get your free guide to jack selection.
Ask for Bulletin HYD. 53.

A Jack for Every Purpose

The Simplex line of jacks is complete. It includes rachet lowering, track, screw and hydraulic jacks; self-contained and remote-controlled center-hole pullers; trench and timber braces. Buyers have known Simplex means quality in jacks for more than 50 years.

WORLD'S LARGEST MFGRS. OF INDUSTRIAL MECHANICAL AND HYDRAULIC JACKS
SIMPLEX JACKS

TEMPLETON, KENLY & COMPANY
2517 GARDNER ROAD
BROADVIEW, ILLINOIS

Begins on page 308

terial on locating faults, high-temperature insulations, insulation-testing devices, use of high-frequency, high-voltage test equipment. *By F. A. Annett and A. C. Roe, McGraw-Hill Book Co., 330 West 42nd St., New York 36. 313 pages. $5.*

Brazing Manual—Said to be the first book compiling information in one place on all the eight brazing processes: torch brazing, twin-carbon arc brazing, furnace brazing, induction brazing, resistance brazing, block brazing, and flow brazing. Gives the techniques of brazing almost every metal of industrial importance. In addition to production information, the book contains sections on testing, quality control, safety, health protection; plus detailed explanations of the causes of defects and how to correct them. *American Welding Society, 33 West 39th St., New York 18. 193 pages. $4.75.*

Power Plant Management—Covers a wide range of management problems in the areas of planning, administering, and operating power plants; with the aim of showing how to produce dependable power at the lowest possible cost. Includes sections on methods and practices in designing and planning the power plant, techniques of administration, and the actual operation of the plant. By *Robert Henderson Emerick. McGraw-Hill Book Co., 330 West 42nd St., New York 36. 333 pages. $6.50.*

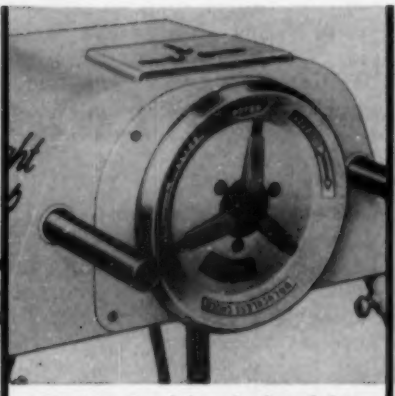
BOOKLETS

Code for Pressure Piping—A new American Standard Code for Pressure Piping is available. It's a reference that should be on the shelves of plant engineers. It's designed to give a standard of minimum safety requirements for: (1) selection of suitable materials and standard specifications by which they may be secured; (2) the designation of proper dimensional standards for the elements of a piping system; (3) design of component parts, assembled unit, and necessary supports; (4) erection of system; and (5) test of system. Sections include power piping sys-

MAINTENANCE MAN THREADS PIPE 4 TIMES FASTER

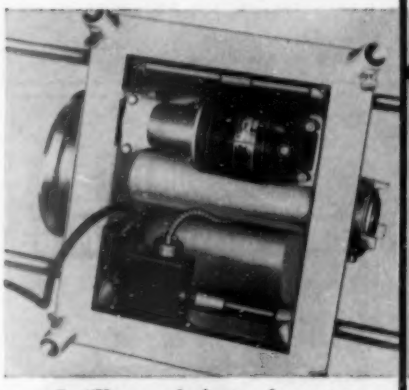
with new OSTER No. 432 Lightweight Champ

1 "We thread pipe the fastest way because piping breakdowns can slow up production. Here's how this 'Lightweight Champ' can keep *your* downtime to a minimum:



2 "A spin of the wheel, and this wrenchless chuck grips securely in both directions. No bar or chuck wrench needed here!

3 "With hand tools converted to power tools, I cut off, ream and thread 1″ pipe in 59 seconds. That's four times faster than by hand! Notice the vise-mount plate—it's universal—takes any make of pipe vise.



4 "You need plenty of power to make top-quality threads fast, and this machine has it in a new, more powerful motor. Universal, geared-head type—reversible, variable speed.

5 "Although all-steel construction makes the 'Lightweight Champ' practically indestructible, it's easy to carry to the job. It's all set up, ready to work, in two minutes. Goodbye to hand threading!"

...the most DURABLE 2″ portable power vise stand on the market!

With improved design, light weight and powerful motor, the new Oster No. 432 "Lightweight Champ" is the ideal maintenance threading machine. Standard range is ⅛″ to 2″ pipe; range with geared tools, 2½″ to 12″ pipe.

Get all the facts now by calling your nearby Oster Distributor, or write us direct for Booklet No. 432.

THE

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MANUFACTURING CO.

Main Office and Factory:

Box 4326-L, Cleveland 32, Ohio

New York Factory Branch Sales and Service, 25-36 Jackson Ave., Long Island City 1, N.Y.

BUILDERS OF COST-REDUCING THREADING EQUIPMENT SINCE 1893

making a
MARKED IMPROVEMENT
in PAINT CAN MARKING

The problem of paper labels on cans becoming dirty and torn (and presenting a poor sales appearance on the retailer's shelf) plagued a typical paint manufacturer, until he began using the Markem Method. Now he's imprinting variable data (color, batch number, etc.) on 1500 lithographed cans per hour with a Markem 70AF machine. Changing imprint simply means sliding new type into the master-plate (instead of ordering 2000 new labels). Whether it's a container, product, part or tag you're marking—for decoration, designation or identification—ask Markem. Thousands have, for the past 40 years. Write Markem Machine Co., Keene 18, New Hampshire.

MARKEM
...TO MAKE YOUR MARK

tems, industrial gas and air piping systems, refrigeration piping systems, fabrication details, fabrication of pipe hangers, supports, anchors, sway bracing, and vibration damping, fabrication of pipe joints, expansion and flexibility. *The American Society of Mechanical Engineers, 29 West 39th St., New York 18. 138 pages. $3.50.*

It Could Happen to You!—A hard-hitting little safety booklet that you might want to put in your reading rack. Coupling cartoons with just-shocking-enough photographs, the booklet illustrates 12 factors that can contribute to accidents—such as too little sleep, loss of temper, too much weekend exercise, roughhousing, and the like. *Good Reading Rack Service, Inc., 76 Ninth Ave., New York 11. 16 pages. Sample copy, 15¢.*

Controls and Techniques for Better Management—A collection of a half dozen papers selected from those presented at an AMA General Management Conference held early this year. The first discusses operations research in non-technical terms, and explains what management can expect from the new tools available to help in the decision-making process. Other papers discuss the pitfalls of collective bargaining, training for cost reduction, and the worth of personnel training. *American Management Association, 330 West 42nd St., New York 36. (General Management Series #176.) 64 pages. $1.75 ($1 to members).*

Automation—a New Dimension to Old Problems—One of the best discussions we've seen of this much-discussed subject. The authors nail down the definition of automation, ask — and answer — the question: "How revolutionary is this development?" Follow it by sections on the likely effects of automation on industrial relations, skills required of the labor force under automation, job classification and seniority rules, implication for education, and so on. *By George P. Shultz and George B. Baldwin. Public Affairs Press, 2162 Florida Ave., Washington 8, D. C. 20 pages. $1.*

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The Good Business Gift
FRESH FLORIDA FRUIT

COLORFUL MEXICAN BASKET (re-usable) brimming full of choice quality, golden ripe oranges, grapefruit, tangerines, shelled pecans, exotic tropical candies and marmalades. A glamorous gift topped with a big red bow!

Shipped in corrugated box for extra protection.

MEXICAN BASKET ½ BUSHEL **$6.95**

MEXICAN BASKET FULL BUSHEL **$12.00**

*EXPRESS PREPAID

SUNSHINE PACK—Beautifully packed, top quality Florida fruit: all oranges, all grapefruit or mixed. Please specify.

FULL BUSHEL $6.00 HALF BUSHEL $4.25
FULL BOX $9.25 ¾ BUSHEL $5.00

Commercial discounts on all quantity orders.

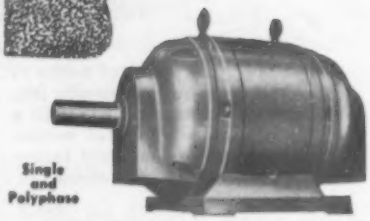
The BARFIELD GROVES
Dept. FM-1 Polk City, Florida

*All prices include delivery charges East of Mississippi River and to La., Ark., and Mo. To Wis., upper Mich., Iowa, Kan., Minn., Okla., Neb. and Texas add 10%. All other states, add 20%.

No shipments to Ariz. or Calif.

All shipments unconditionally guaranteed.

CUSTOM-BUILT— NOT CUSTOM PRICED



Single and Polyphase

Fully enclosed Ball Bearings; semi-enclosed construction that protects against dripping and splashing hazards and assures cool, continuous operation. Available in polyphase—from ½ to 60 hp, single phase—from ½ to 5 hp, for wide adaptability of use and greater flexibility in your power planning.

Write for Complete Details Today

VALLEY
ELECTRIC CORPORATION
4221 FOREST PARK BLVD · ST. LOUIS 8, MO.

#1 **IMPROVED SPHERICAL ROLLER BEARING...**

Size for size, more capacity and longer life than any other spherical roller bearing. Introduced by SKF two years ago; now available in the popular series. Already adopted by hundreds of leading manufacturers.

#2 **HIGHER CAPACITY CYLINDRICAL ROLLER BEARING...** With crowned rollers and cylindrical raceways, engineered for today's high speed–high load applications. Available with flanged or flangeless rings to meet design requirements.

Four of the Many

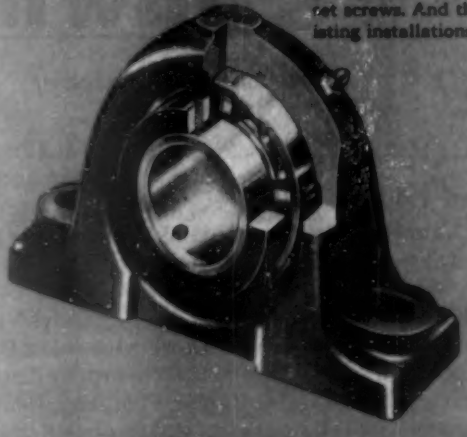
SKF

QUALITY PRODUCTS

It's easier and safer to buy from SKF because SKF makes an exceptionally complete line of ball bearings and roller bearings and spherical roller bearings.

#3 **"SY" UNIT PILLOW BLOCK WITH SUPERIOR BEARING SEAL...**

Red Seals, of DuPont "Fairprene", team with a rotating flinger to exclude dirt and retain lubricant. The "SY" Pillow Block is easy to mount – just slide unit on shaft, tighten two set screws. And the "SY" is interchangeable with existing installations.



#4 **QUIETER RUNNING SINGLE-ROW DEEP GROOVE BALL BEARINGS...**

With proven SKF Red Seals which keep dirt out and lubricant in. Available with any of 13 combinations of Red Seals, shields and snap-rings.

To Get The Most Valuable Book You Ever Had...

Catalog #390 – Complete technical and engineering data on SKF's complete anti-friction line. Send for your copy to **SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.** – *manufacturers of* SKF *and* HESS-BRIGHT® *bearings.*

SKF®

BALL AND ROLLER BEARINGS

© 1955 SKF Industries, Inc.

Under heavy load Gates Vulco Ropes—the V-belts with concave sides—grip pulley grooves more firmly and pull harder.

This large lathe was formerly driven by a flat belt which slipped on heavy cuts, stalled and broke tool bits. Savings on broken tool bits alone offset the cost of the drive the first year ...and production was increased 25%.

Concave sides keep belt costs down!

Industry is saving thousands and thousands of dollars every year by specifying Gates Vulco Ropes—the V-Belts with *concave sides* (U.S. Pat. No. 1813698).

Here's the interesting reason *why* Gates belts save money:

On the bend around the sheave the *precisely engineered* concave sides (Fig. 1) of the Gates belt fill out and become straight (Fig. 1-A). Thus the belt makes uniform contact with the sides of the pulley. That means sure pulling power and *even distribution of wear*. Longer wear, fewer replacements cut belt costs...reduce down time...contribute to profits.

Simple test proves value of concave sides

Bend a straight-sided belt (Fig. 2) and feel the sides *bulge out* around the bend. The bulging sides prevent the belt from fitting evenly in the pulley groove (Fig. 2-A). Uneven contact causes uneven wear...shortens belt life...increases costs.

Keep belt costs *down* by specifying Gates Vulco Rope Drives—the V-Belt with *concave sides*. Belts you need are readily available from nearby distributor stocks. The Gates Rubber Company, Denver, Colorado—*World's Largest Maker of V-Belts.*

Gates Engineering Offices and Distributor Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

ZPA 29-A

GATES VULCO ROPE DRIVES

...because it Costs Me Less"

This isn't double talk. It's the direct quote of hundreds of shrewd paint buyers who have specified Barreled Sunlight for many, many years. They pay more for Barreled Sunlight because it costs them less.

And here's the lay of their logic!

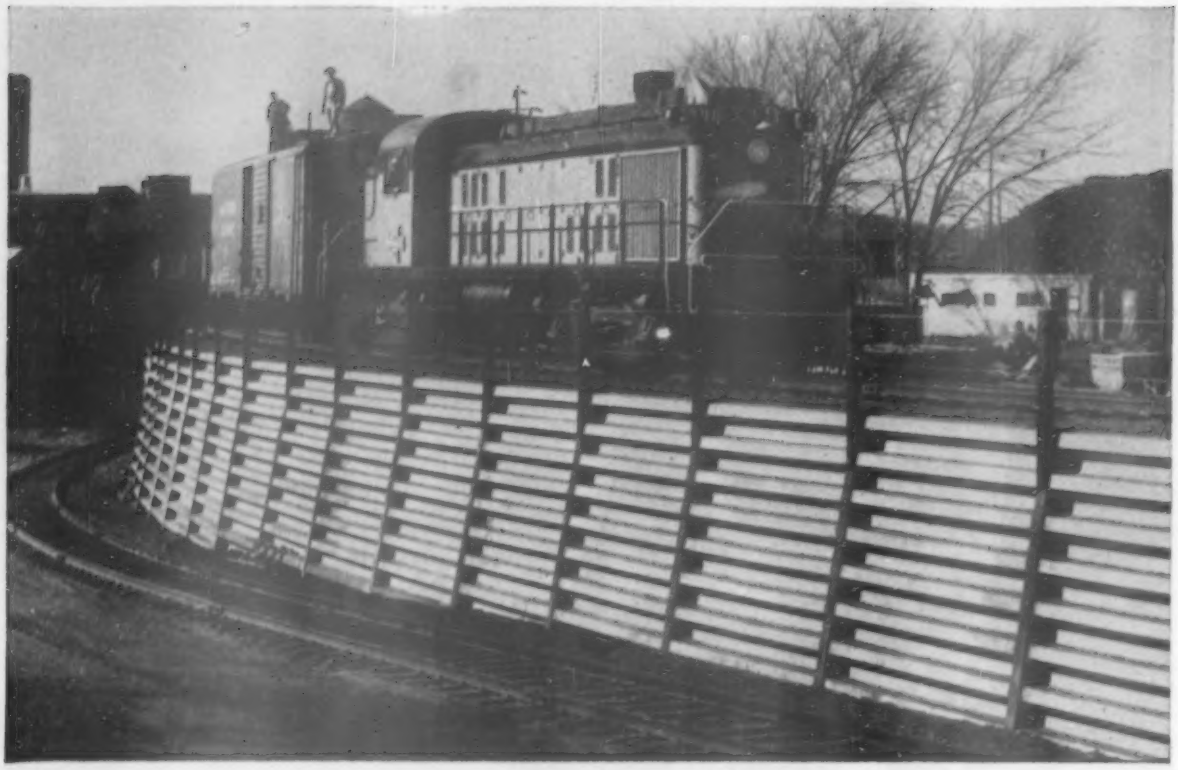
Barreled Sunlight may cost a few more pennies per gallon . . . but Barreled Sunlight is so loaded with high quality ingredients, it takes up to a gallon of thinner for every five gallons of paint. You buy less *paint* for the job.

And most important . . . Barreled Sunlight goes on so fast, solidly covers so much more area per brushful, and looks so much better longer, your painting costs go down. That's right, your painting costs . . . *your labor costs* which represents 80% of the total cost go down on both initial and repaint work.

Why not, right now, let our nearest representative prove to you, in your own building . . . on your own walls . . . how you can save money with Barreled Sunlight quality paints? Write and he'll call. Barreled Sunlight Paint Company, 2-G Dudley Street, Providence 1, Rhode Island.

Barreled Sunlight Paints

In whitest white or clean, clear, wanted colors, there's a Barreled Sunlight Paint for every job



Armco Bin-Type Retaining Wall

Saves Valuable Plant Property

Thanks to Armco Bin-Type Retaining Wall this Wisconsin Paper Mill was able to bring an elevated railroad spur into their plant without losing valuable yard space.

During plant expansion, the plans called for one set of tracks to enter the plant 16 feet higher than the lower siding. Soil conditions ruled out the use of cribbing and a trestle would present a continuous maintenance problem.

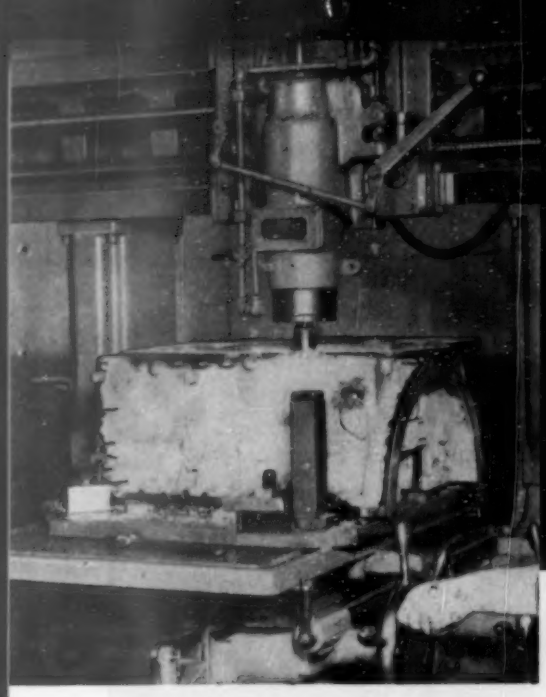
But the Armco Retaining Wall was able to carry the live load of the railroad with little space between the two sidings. The steel wall adjusts to unstable soil conditions and takes up little space.

This illustrates just one of the many jobs Armco Bin-Type Retaining Walls are doing for industry. Other uses include preventing stream erosion, protecting property from encroaching earth, controlling unstable slopes and putting waste land to use.

Perhaps an Armco Retaining Wall can solve similar problems on your properties.
A request to us will bring prices and complete information applied to your specific needs.
Armco Drainage & Metal Products, Inc., 6245 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

Armco Bin-Type Retaining Walls

ARMCO®



If limits are measured in .0001ths

chances are

Fafnir has a bearing on it

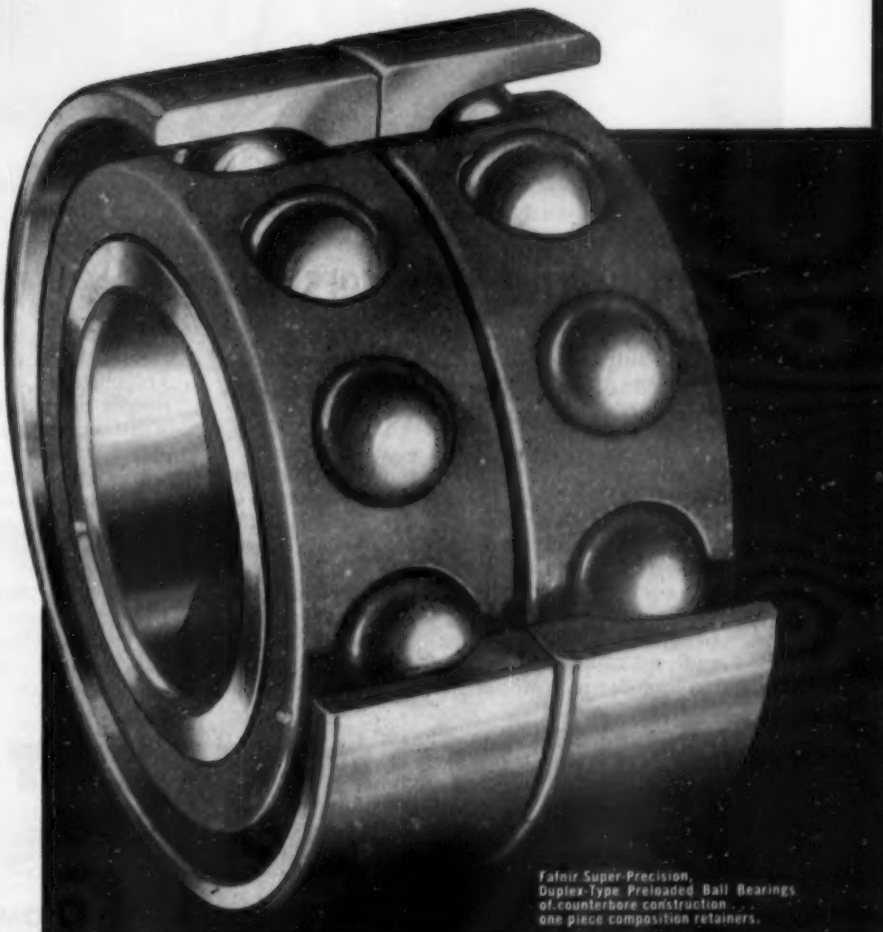
Precision designing and construction of the spindle head illustrated make possible extremely accurate profiling or milling at twelve operating speeds ranging from 260 to 6200 rpm. Design specifications include four pairs of Fafnir Super Precision Ball Bearings on the spindle shaft. These "jewels of industry" provide the ultimate in axial and radial rigidity. They run cool under exacting conditions of load and speed . . . conserve power . . . need no adjustment . . . and are permanently grease-packed.

It's in places like this where limits are in .0001ths that you find Fafnir Super-Precision Bearings . . . because they are *manufactured* in a separate super-precision department to the highest standards of dimensional control . . . in a wide range of sizes and types. There could be no better example of the "attitude and aptitude" of Fafnir engineers toward solving bearing problems.

If bearings are important to you, a few minutes spent with a Fafnir representative may help you get the right answer quickly.

The Fafnir Bearing Company,
New Britain, Connecticut.

MOST COMPLETE LINE IN AMERICA



Fafnir Super-Precision, Duplex-Type Preloaded Ball Bearings of counterbore construction . . . one piece composition retainers.

FAFNIR BALL BEARINGS

SAM RAUDEBAUGH, sales engineer for Ohio Belting and Transmission Company, Worthington distributor, checks installation of V-belt drive at Dana Corporation's Toledo Division.

V-belt drive hammers home 15% production increase

Worthington distributor solves problem and reduces customer's maintenance costs from $2,500 to $10 a year

That's the report, after a year and a half of operation, on the Worthington Multi-V-Drive installed in place of a costly gear drive on a board hammer at the Toledo Division of the Dana Corporation, Toledo, Ohio.

The old drive just couldn't take the shock loads the hammer was handing out in the auto part forging operation. Gear teeth and shafts kept giving way. The result: a $2,500 yearly maintenance bill plus production loss due to downtime. After looking at these figures, Dana engineers talked to Ohio Belting & Transmission Company, Worthington distributor, who recommended a new Worthington V-belt drive with Worthington QD sheaves, Worthington-Goodyear V-Belts and a tension-control motor mount.

Breakdown troubles vanished. Total maintenance cost in the first year: $10! That was proof enough for the Dana Corporation; they're changing over the 15 remaining hammers to the same kind of drive.

Find out how the Multi-V-Drive combination of Worthington QD sheaves and matched Worthington-Goodyear V-belts can work for you. Get in touch with your nearest Worthington distributor — or write Worthington Corporation, Mechanical Power Transmission Division, Section MV.5.28, Oil City, Pa.

MV.5.28

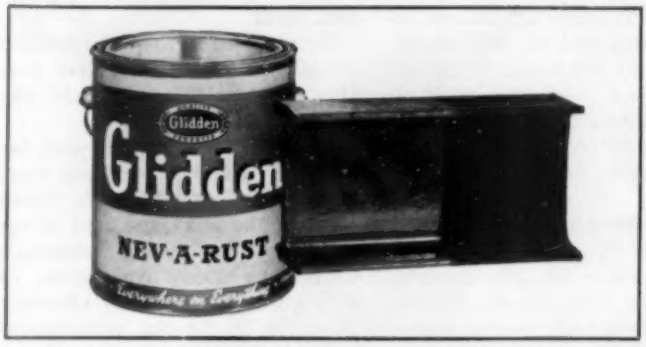
WORTHINGTON

BUY THESE WORTHINGTON STANDARD PRODUCTS FROM YOUR LOCAL DISTRIBUTOR

Compressors • Pumps • Multi-V-Drives • Variable Speed Drives

PAINTING ANALYSIS

Learn how new Glidden painting service can help you cut costs!



New Formula NEV-A-RUST dries to a sparkling, high gloss; has greater resistance to rust, acid, gases, fumes. Ideal for structural steel, iron fences, grillwork, smokestacks, metal roofs and all metal surfaces.

Now Glidden offers a no-cost, no-obligation analysis of *any industrial painting problem.* This new service can be as comprehensive as you wish—anything from stain for a paneled office to special paint formulations to end corrosion on a water tower. A Glidden Painting Analysis can help you train personnel, work out safety markings, make color efficiency tests or work out complete office and plant redecoration!

Pictures at left show a few of the ways a Glidden Painting Analysis can help you. For more information or for specific helps, fill in coupon below.

Four-Year Exposure Test of bricks above shows superior durability of SPRED GLIDE-ON — new exterior masonry finish for stucco, brick and asbestos shingles. Brick at left painted with SPRED GLIDE-ON did not peel, chip or flake in four years.

Glidden

Professional Finishes

The Glidden Company
Maintenance Finishes Division
Cleveland 2, Ohio

New catalog includes complete specifications and product guide, selector charts, color chips, information on special finishes of all types — this book is a *must* for reference; training of personnel; purchasing guide.

Fill in and mail to The Glidden Co., Dept. FM-1155
11001 Madison Ave., Cleveland 2, Ohio

- ☐ I am interested in complete details of Glidden Painting Analysis.

I am particularly interested in:

- ☐ NEV-A-RUST; other anti-corrosion finishes.
- ☐ Product demonstrations for training purposes.
- ☐ Color Studio Service
- ☐ SPRED GLIDE-ON
- ☐ New Glidden complete-line catalog

Name_____

Title_____

Company_____

Address_____

City_____ **Zone**____ **State**_____

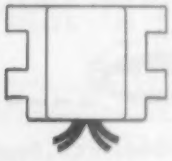
Another
FURNAS "FIRST"
"DUAL SEAL" COILS

FEATURES

- Moisture and Fungus Resistant
- Excellent Heat Dissipation
- Dimensionally Stable
- Mechanically Stronger
- Non-combustible

Furnas Electric again leads the field —this time with magnetic controls with Dual Seal coils for longer control life. Dual Seal molded coils are moisture and fungus resistant, dimensionally stable, age resistant, will not support combustion and have high dielectric strength. Their mechanical properties eliminate the damage often caused by vibration or impact.

DUAL VOLTAGE COILS



Coil changing is virtually eliminated and stocking of coils simplified with the new Dual Seal dual voltage coils. For example, on 3, 7½ or 10 hp. starters, one 220-440 volt Furnas Electric coil is used where six are normally required.

Write today for free 140-page Catalog 101. Furnas Electric Company, 1032 McKee Street, Batavia, Illinois.

FURNAS ELECTRIC COMPANY
BATAVIA, ILLINOIS
Sales Representatives in all Principal Cities

FACTORY | NEW FILMS

Ductile Cast Iron describes the properties of this new engineering material, and points out its similarity to steel. Illustrates with bending, twisting, impact, and tensile tests. Shows various applications, including gears, pinions, plow shares, pistons, and pneumatic couplings. 16mm, sound, color, 15 min. Available for loan from:

International Nickel Co., Inc., 67 Wall St., New York.

To Enrich Mankind explains the significance of the role mechanical engineering plays in this country's development. Shows its contributions to progress in such diverse objects as farm machinery, home appliances, aircraft, automobiles, machine tools, rockets, atomic reactors, printing presses, etc. 16mm, sound, color, 25 min. For free loan, write:

American Society of Mechanical Engineers, 29 West 39th St., New York 18.

Fiery Magic shows, by means of an animated flow chart, the consecutive steps in the manufacture of calcium carbide. Also illustrates the various applications of acetylene — from its early use in lamps to its present use as a base in modern chemical processes. 16mm, sound, color, 23 min. For free loan, write:

National Carbide Co., 60 East 42nd St., New York 17.

More Than Meets the Eye demonstrates the progress made in the manufacture of telephone cables since construction of the first 75 years ago. The original conduit contained 62 pairs of wires as compared to 4000 wires contained in a similar-size conduit today. 16mm, sound, color, 13½ min. Available from:

Western Electric Co., 195 Broadway, New York 7.

Sinews of the South tells the story of steel production in one company's plants in southern U.S. Includes scenes from ore and coal mines, quarries, conditioning plants, blast furnaces, open hearth furnaces, and operations in various finishing mills. Points out the vast amount of work entailed in the production of one ton of pig iron. 16mm, sound, 34 min. Available for distribution in southern states only. For information, write:

Birmingham Film Distribution Center, Tennessee Coal and Iron Div., U.S. Steel Corp., Fairfield, Ala.

Project 074 deals with the work being done by the use of atomic energy in engine wear research. Shows some of the machines used in the laboratory for testing lubricants. Gives case study comparison of testing the wear-reducing efficiency of an oil by the old, conventional method and the new one using a radioactive piston ring fitted to the engine. 16mm, sound, black and white, 13 min. Available for rent ($2.50), or for purchase ($45) from:

British Information Services, 30 Rockefeller Plaza, New York 20.

People, Products, and Progress: 1975. This film forecasts what life in this country *can* be like in 1975. Predictions are based on sound, carefully calculated studies by leading trade associations and industrial firms. Pictures such future products as atomic-powered automobiles, doors of air, two-way wrist radios, man-carrying rockets, thin wall-hanging TV sets, and many others. 16mm, sound, color, 28 min. Available for rent ($15) or purchase ($125) from:

Chamber of Commerce of the U.S., Washington 6, D. C., or C. of C. division offices.

Body Bountiful documents one manfacturer's concept of mass production in the automobile industry, with emphasis on craftsmanship and quality. Explains operations of precision machinery in company's 33 plants. Depicts techniques of side-frame assembly, and the actual sculpturing of the auto body. 16mm and 35mm, sound, color, 25 min. For information, write:

Fisher Body Div., General Motors Bldg., Detroit 2.

Turn the page

Q. Why does Blanchard grind its own machine parts on a Blanchard?

A. It's the only way we know to get highest quality at lowest cost!

Shown here are 117 different parts of a #18 Blanchard Grinder. 239 surfaces on these 117 parts were ground on a Blanchard, for the simple reason that *there isn't any better way.*

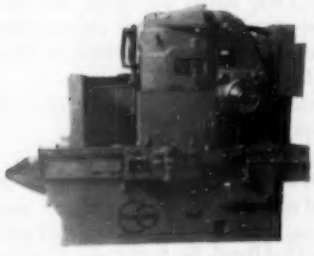
Everyone who uses Blanchard Grinders knows that Blanchard elements are machined with extreme accuracy . . . that they *have to be!*

Furthermore, Blanchard users everywhere would undoubtedly agree fully with these two actual statements recently made by customers:

"There is no greater machine tool money value than a Blanchard. It is the best buy we ever made".

"Until our Blanchard went to work, I never realized I could actually save so much, as compared to previous methods of machining flat surfaces".

If you do not own a Blanchard, we invite you to select some of your own components, and let us give you estimates to compare with your present quality control tolerances and machining costs. Chances are you'll find it will pay you to *"PUT IT ON THE BLANCHARD".*



P. S. You guarantee yourself full benefit from your Blanchard Grinders when you use the correct Blanchard abrasive wheels!

Send for free copies of "Work Done on the Blanchard", (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

FLEXCO®

BELT FASTENERS and RIP PLATES

FOR HEAVY CONVEYOR AND ELEVATOR BELTS OF ANY WIDTH

★ FLEXCO Fasteners make tight butt joints of great strength and durability.
★ Trough naturally, operate smoothly through take-up pulleys.
★ Distribute pull or tension uniformly.
★ Made of Steel, Monel, Stainless, Everdur. Also Promal top plates.
★ FLEXCO Rip Plates are for bridging soft spots and FLEXCO Fasteners for patching or joining clean straight rips.

Compression Grip distributes strain over whole plate area

Order From Your Supply House. Ask for Bulletin F-100

FLEXIBLE STEEL LACING CO., 4678 Lexington St., Chicago 55, Ill.

PORTABLE
BRULÉ
TRASH BURNERS
SAVE COSTS - TIME - SPACE

● You can save dollar after dollar from going to waste with a fast acting, highly efficient Brule Trash Burner. The FG4-T series has made a type available for a wide variety of industries. Extensive installations has proven that trash burning problems can be easily and effectively simplified.

Each unit has three chambers: the firing chamber into which the wastes are charged—the combustion chamber in which complete combustion occurs and in which fly ash separates out—the upper chamber which assures ultimate completion of combustion. For example the FG4-T5 burns 500 lbs. of usual plant wastes per hour with same reduced to but one pound of ash.

1. You cut costs by reducing waste handling personnel—you lower dump costs, scavenger costs, pit costs and fire insurance premiums.
2. You save space usually used to store wastes.
3. You minimize the danger of fires.
4. You promote efficiency of personnel thru cleanliness.
5. You simplify your trash removal problem.
6. You add to safety.

● More than 40 years of design experience is back of these units. Available in 200, 300, and 500 lbs. per hour capacity. Get the complete, important story.

In Canada:
J. H. Lock & Sons, Ltd.
150 Perth Ave., Toronto, Ont.

Brulé Incinerators, 407 S. Dearborn St., Chicago 5, Ill.
Please Send Bulletin 52B

Company .....
Your Name .....
Address .....
City ..... Zone ..... State .....

FACTORY / FILMS
Begins on page 320

SUGGESTION SYSTEMS

These films are listed as a supplement to the article, "More From Your Suggestion Plan" (p. 114).

What's Your Idea describes how a suggestion system works, explains the reasons some suggestions are rejected, and shows the results of the successful adoption of others. Designed to stimulate further suggestions. 16mm, sound, color, 17 min. For loan, write:
General Mills, Inc., 400 Second Ave. South, Minneapolis 1.

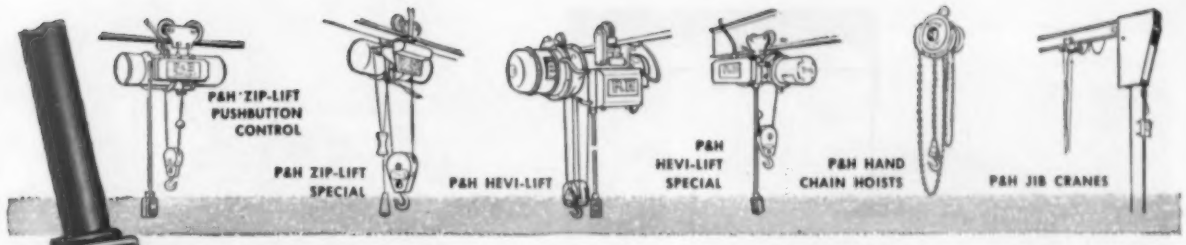
Suggestions Unlimited shows how employees' suggestions are handled in one company by suggestion committees. Depicts the results of 10 typical suggestions that helped eliminate unsafe working conditions, control waste, increase production, simplify work. 16mm, sound, color, 30 min. For loan, write:
Illinois Central Railroad, 135 East 11th Place, Chicago 5.

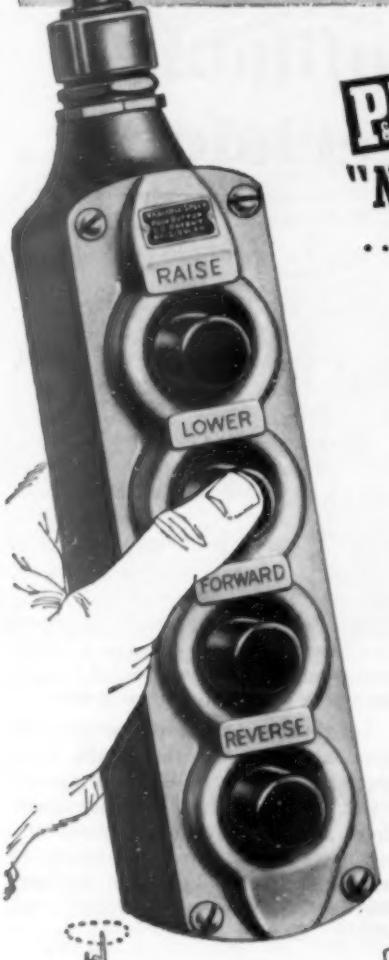
Suggestion Box gives examples of how improved methods in manufacturing have resulted from workers' suggestions. 16mm, sound, black and white, 10 min. For rent ($1) from:
University of Michigan, Audio-Visual Center, Ann Arbor, Mich.

Suggestion Power points out the effectiveness of employee suggestions in improving working conditions and developing time-saving devices. 16-mm, sound, black and white, 18 min. For purchase ($29.11), write:
United World Films, Inc., 1445 Park Ave., New York 29.

Coin Your Ideas promotes the use of the suggestion system among employees. 16mm, sound, color, 8 min. For loan, write:
Esso Standard Oil Co., Training Center, Elizabeth, N. J.

Everywhere You Look describes in detail one company's suggestion box system, and shows how it pays off. Sound slidefilm, color. For purchase or free loan, write:
General Electric Co., 570 Lexington Ave., New York 22.





P&H 24-volt circuits guarantee: "No electrical danger to the operator!"

. . . and every P&H Hoist is easily reconnectable within the control box to 220 or 440 volts

If your hoists have to work in moist, humid atmospheres where the operator is constantly grounded, then a P&H Hoist is a natural for you. Only 24 volts travel into the pushbutton control station on these husky load-handlers — completely eliminate electrical danger to the operator. P&H engineers have cut both voltage and amperage way down in this simplified control system—you get *safer* hoisting — easier hoisting.

And what's more — you don't buy a one-voltage hoist when you choose a P&H. For every P&H is easily reconnectable within the control box — to 220 or 440 volt operation. It's a simple, quick operation that any workman can perform in ten minutes — and he doesn't have to tear the hoist apart to do it. Send the coupon below for more information on the P&H Hoist line. P&H Hoist Division, Harnischfeger Corporation, 4525 W. National Ave., Milwaukee 46, Wisconsin.

Tear out and mail today

P&H HOIST DIVISION, HARNISCHFEGER CORPORATION 3002
4525 West National Avenue, Milwaukee 46, Wisconsin

Gentlemen: Please send me complete information on the reconnectable P&H Hoists, with their safe 24-volt control circuits.

Name..... Title.....

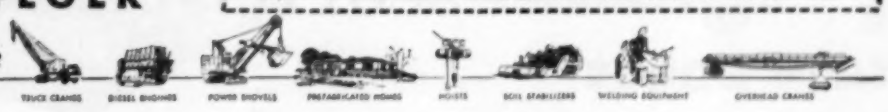
Company.....

Address.....

City..... Zone..... State.....

HARNISCHFEGER

the **P&H** *Line*



Profitable decision...

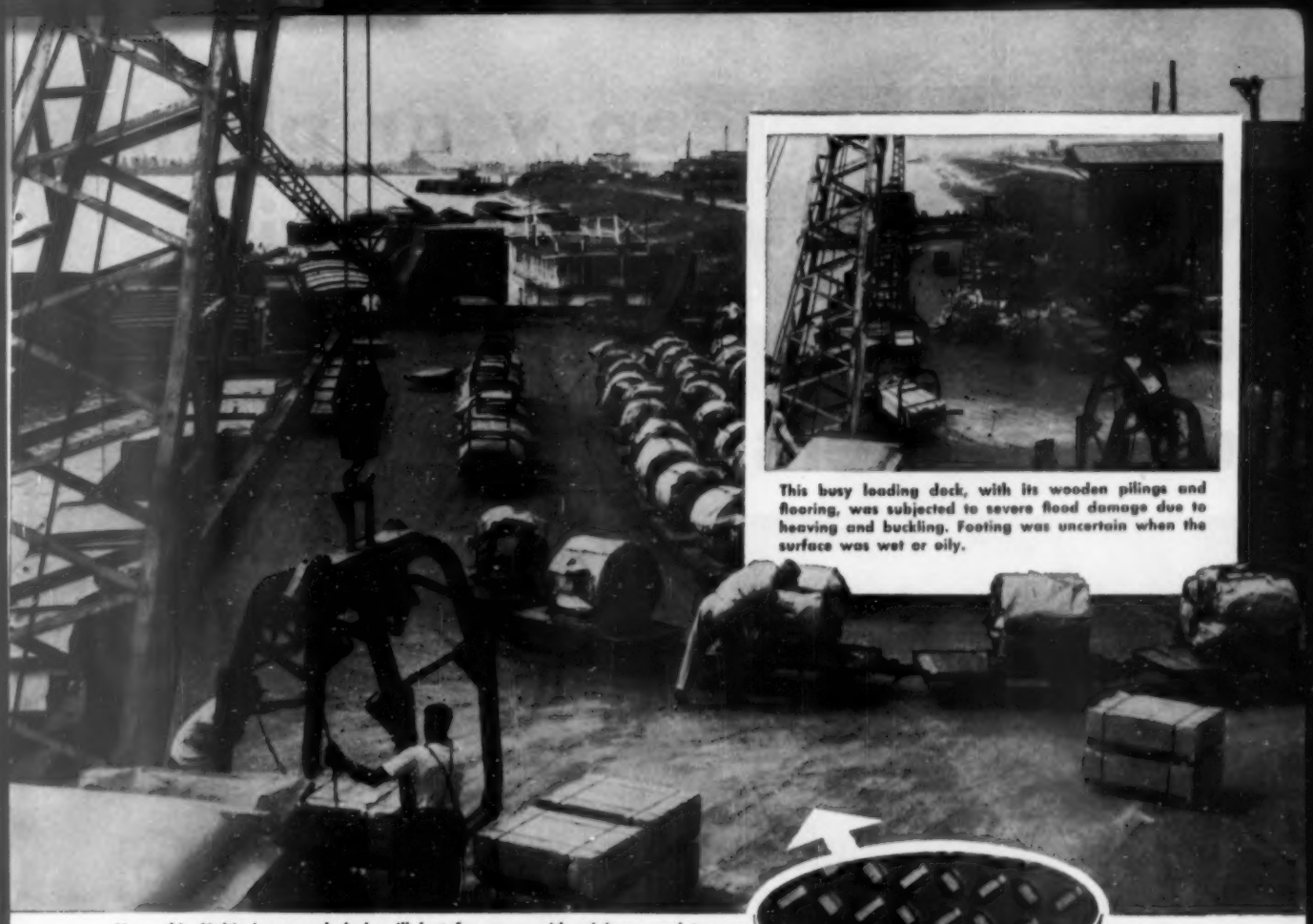
Just *any* towel won't do for the company washrooms. There's a difference in quality between one brand and another, a difference in drying power—a difference in cost.

Because one ScotTissue Towel dries both hands, consumption and cost per user are low. Because ScotTissue Towels are quick-absorbing, soft and white—there's a noticeable difference in quality.

When you choose ScotTissue Towels, you choose the brand most people buy for their own homes. When you choose ScotTissue Towels you make a profitable decision—from your point of view, from your employees' point of view.

Let your local Scott representative or distributor give you the details. Scott also has a "Planned Poster Program" which helps to promote washroom cleanliness and cut towel consumption. This is yours without obligation—simply by writing the Scott Washroom Advisory Service,® Scott Paper Company, Dept. FM-11, Chester, Pa.

It's good business to use **SCOTTISSUE® TOWELS**



This busy loading dock, with its wooden pilings and flooring, was subjected to severe flood damage due to heaving and buckling. Footing was uncertain when the surface was wet or oily.

Now, this Multigrip-covered dock will last for years with minimum maintenance. Evenly spaced "safe-tread" risers give sure-grip traction plus simplified cleaning and exceptional drainage. Permanent support is given by USS H-Beam Bearing Piles.

Dock flooring replaced **once and for all**

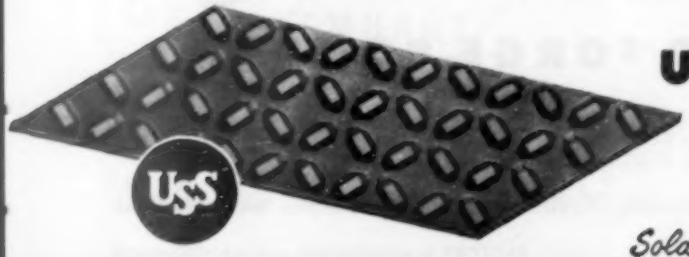
with USS Multigrip Floor Plate

Periodically, the waters of the mighty Mississippi rise . . . causing considerable damage to riverside loading docks. The force of these turbulent flood waters buckles, and often collapses, wooden pilings and flooring. Damage like this means expensive repairs, as well as costly delays in loading operations. Such was the case with a busy dock owned by Mississippi Valley Barge Line Company.

Flood losses and resulting delays were eliminated when Stupp Brothers Bridge and Iron Co. of St. Louis, and Massman Construction Company, Kansas City, Mo., used U.S. Steel Multigrip Floor Plate to renovate this dock, which has already had the sub-structure replaced with steel bearing piling. Now, Multigrip Floor Plate, with flat-topped, "safe-tread" risers, will give many years of sound support plus sure-grip traction for feet and the small diameter wheels on fork trucks and freight dollies.

Indoors or out, USS Multigrip Floor Plate is a wise investment in long-term plant safety. Each "safe-tread" riser with its clean, flat top, acts as an accident stopper in danger areas. Because Multigrip is made of tough steel, it gives extra years of low maintenance service in heavy traffic areas. Multigrip is available in large plates (cutting installation waste) and may be bent or formed for structural use.

UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, CHICAGO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



USS multigrip

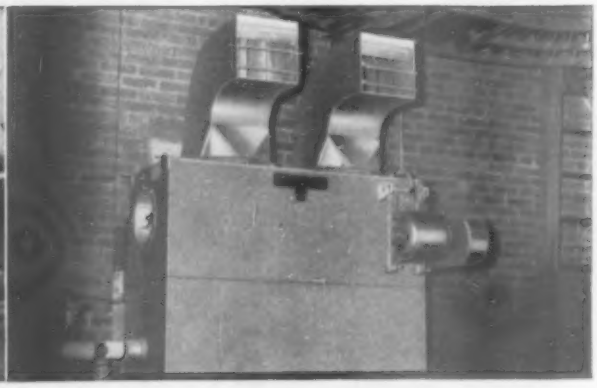
FLOOR PLATE

Sold by leading distributors from coast to coast

UNITED STATES STEEL

. . . keep your plant warm and ventilated with *efficient, compact* "Buffalo" unit heaters

SUSPENDED "LOWBOY" HEATS, VENTILATES



"HIGHBOY" WITH FRESH AIR INTAKE

- *Easy, fast installation* with their sectionalized construction. Suspended or floor models to suit your layout!
- *Efficient, non-freeze aerofin coils* radiate maximum heat — permit space saving construction!
- *Smooth, quiet, stable performing* "Buffalo" mixed-flow fans give effective heat distribution!
- *Exclusive "Buffalo" swivel outlets* aim flow of air just where you want it!
- *Models with filter section* to provide fresh, clean makeup air!
- *Easy maintenance* — fan bearings lubricated from outside bearing bowl. All parts standardized, easily accessible!
- *Long life that means low costs!* Heavy-duty paneling, fans, swivel outlets, coils and bearings are built to last.
- *The "Buffalo" "Q" Factor* — the built-in Quality that provides trouble-free satisfaction and long life — in any "Buffalo" product you buy.

WRITE FOR BULLETIN 3704A! Gives full details on the right units to handle your heating, ventilating or makeup air problem — including air diffusion distances for each unit and capacity up to 35,000 cfm. Write for your copy today!

"Buffalo"

BUFFALO FORGE COMPANY

471 BROADWAY BUFFALO, NEW YORK

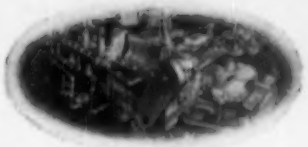
PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

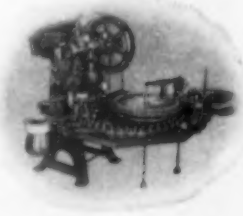
Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

Machines that do one job today and another job tomorrow



THROUGHOUT THE WORLD Hartford-Empire Gob Feeders are used to serve forming machines with molten glass—shaped for best manufacture of all types of glassware.



SIMPLE OR COMPLEX tooling set-ups are equally efficient on V & O power presses. True alignment is assured by long slide precision and overall sturdiness of V & O s.

BOTTLES OR CANS can be automatically loaded into shipping cases on Standard-Knapp 830 Casers. Simple in-plant adjustments effect the change.

QUICK-CHANGING of dies is one reason why Henry & Wright Dieing Machines can be used for simple blanking today and complex metal stampings tomorrow.

Emhart equipment enables you to meet today's requirements and tomorrow's changes. Our condensed catalog of over 275 machines will give you more details.

EMHART
S-K

EMHART MANUFACTURING CO., HARTFORD 2, CONNECTICUT

Western representative: MAILLER SEARLES, INC., Los Angeles and San Francisco

Only the best is good enough

EMHART MFG. CO.
Hartford 2, Conn.

Please send your condensed catalog of Emhart machines.

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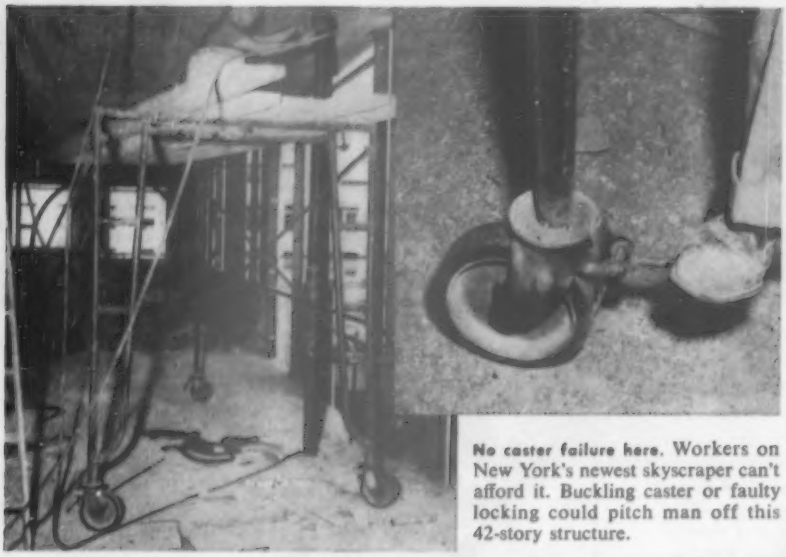
MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

40 stories above 42nd St. casters and locks can't fail!



No caster failure here. Workers on New York's newest skyscraper can't afford it. Buckling caster or faulty locking could pitch man off this 42-story structure.

Riding high with Bassick

Bassick casters lend a hand as the world's largest steel-sheathed (also the largest fully air conditioned) building climbs skyward at Lexington and 42nd in New York.

Handling mobile workmen's scaffolds on the unwalled edge high above the street calls for the safest, sturdiest casters money can buy. No wonder it's heavy-duty "S99" Bassicks you see above. Designed to stand the abuse of power-pulled trucks and assembly line dollies, they swivel easily and roll surely over rough flooring where a sudden lurch or buckling could spell disaster. Extra-heavy king pins provide unusual strength needed for loads up to 1500 lbs. each, while positive Bassick position locks keep wheels from rolling, hold the scaffolds securely in place.

Bounceless caddy-carts for aircraft engines

Fairchild dollies for precision aircraft engines use four 10-inch dual wheel Floating Hub Bassick casters to prevent damaging shock.

Individually sprung wheels absorb both vertical and horizontal shocks. Vibration frequencies are interrupted and immediately damped out by Bassick's inherent snubbing action to guard against resonance and fretting corrosion.

New super-heavy, economical formed-steel "S99" casters

Double-ball-race design makes swivelling easy. Grease retainer cup and Alemite fittings aid lubrication. Plunger-type swivel lock available. Tough, heavy steel (¼" thick) provides extra strength. Fully hardened cold-formed steel raceways, extra-heavy king pin insures long life.

Rigid casters, too, team up with swivel models to meet every materials-handling application. "S99" Bassicks take loads up to 1500 lbs. each.

Quick-change artist

Here's a pony express — 1955 style. When Greyhound buses need fresh horsepower the special Bassick-equipped mobile mounting device you see above slides under the back end of the bus and rolls away the entire engine for repairs.

A fresh engine from stock is guided back into position the same way, connected in place — and the Greyhound is ready for another lap across country.

Job of handling the Greyhound's heavy expensive engines goes (naturally) to Bassick extra-heavy-duty "S99" casters.

Overweight wagon designed by Fairchild to move extremely heavy press dies, rolls easily on big, grooved wheel extra-heavy-duty Bassick casters.

Check your Bassick Distributor

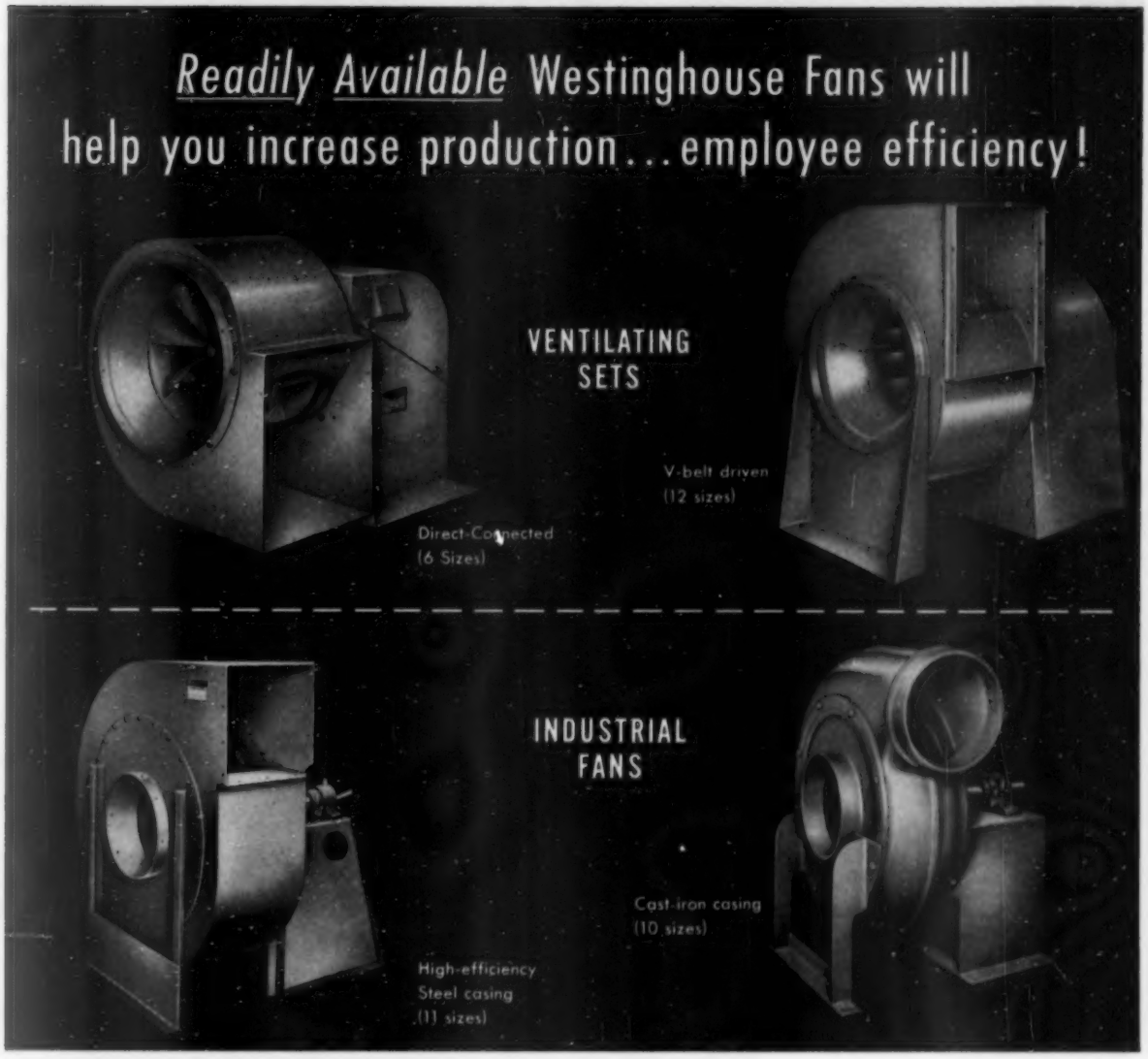
He has many standard casters in stock. He is in business to serve you . . . call him when you want casters and wheels.

THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada:
Belleville, Ont.

Bassick
A DIVISION OF STEWART SW WARNER

MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE

Readily Available Westinghouse Fans will help you increase production... employee efficiency!



Whatever your air handling problem . . . smoke, fumes, vapor, dust, wood shavings, granular material or ventilating . . . these Westinghouse fans are designed to handle or remove them . . . efficiently and economically.

INDUSTRIAL FANS (Steel Casing) . . . high efficiency for general Air Handling; fume and dust removal; 11 sizes, each with 3 types of wheel for specific applications. Wheel diameters 19" to 64"; inlet diameters 11" to 37".

INDUSTRIAL FANS (Cast Iron Casing) . . . ruggedly built, corrosion resisting. For low volume fume or dust removal, materials conveying, industrial drying and cooling. In 10 sizes, each with 3 types of wheel for specific applications. Wheel diameters 8" to 34"; inlet diameters 4½" to 18".

VENTILATING SETS (Direct-Connected) . . . Compact, efficient, ready-to-run. Especially suited for small ventilating installations. Cleanable radial blade wheel minimizes problem of handling airborne dirt and grease. Six sizes. Wheel diameters 6" to 15"; inlet diameters 6" to 14".

VENTILATING SETS (V-belt driven) . . . Self-contained. Install indoors or outdoors in a wide variety of heating, ventilating or air conditioning applications. Twelve sizes. Wheel diameters 9" to 30"; inlet diameters 10" to 32⅞".

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE... IF IT'S

Westinghouse

J-80439

Westinghouse Electric Corporation
Sturtevant Division, Dept. 1L
Hyde Park, Boston 36, Mass.

Please send facts on Industrial Fans and Ventilating Sets.

NAME AND TITLE.....

COMPANY.....

CITY..... STATE.....

"color blind" far-infrared bakes paints of various colors on metal parts

To bake paint of various colors on different-sized metal parts . . . in large production quantities . . . presented an exacting heat problem for this manufacturer.

Installing four "color blind" Chromalox far-infrared radiant heaters in a reflective overhead oven solved the problem. Total capacity is only 14,400 watts. Longer wave length radiation is "blind" to color differences and therefore heats even white with negligible reflection.

Overhead oven was easy to build; has low initial and operating costs; requires no floor space. Conveyor system readily handles larger units individually or a number of small parts on three tier frames; has operating speed of about 4½ feet per minute.

Results are rapid, uniform baking of paint, regardless of color, on approximately 22,000 units during an eight-hour shift. Fast heat-up time. Minimum maintenance—all-metal radiant heaters are self-cleaning and resist damage.

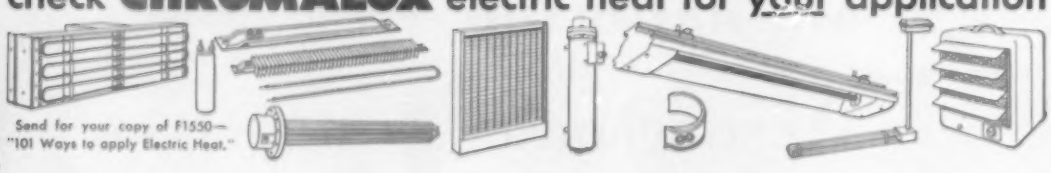
This problem-solution-result approach has enabled us to help many manufacturers produce better, faster, at lower cost.

Always available to you are our research, engineering, design and modern manufacturing facilities. The world's largest factory stock of industrial heaters plus local stocks at strategic points. And a 33-city nationwide sales and application service.

Let us know your problem for controlled heat and we'll go all out to help you find the right answer—electrically. A-4449

EDWIN L. WIEGAND COMPANY
7518 Thomas Boulevard, Pittsburgh 8, Pa.

check CHROMALOX electric heat for your application



Send for your copy of F1550—"101 Ways to apply Electric Heat."

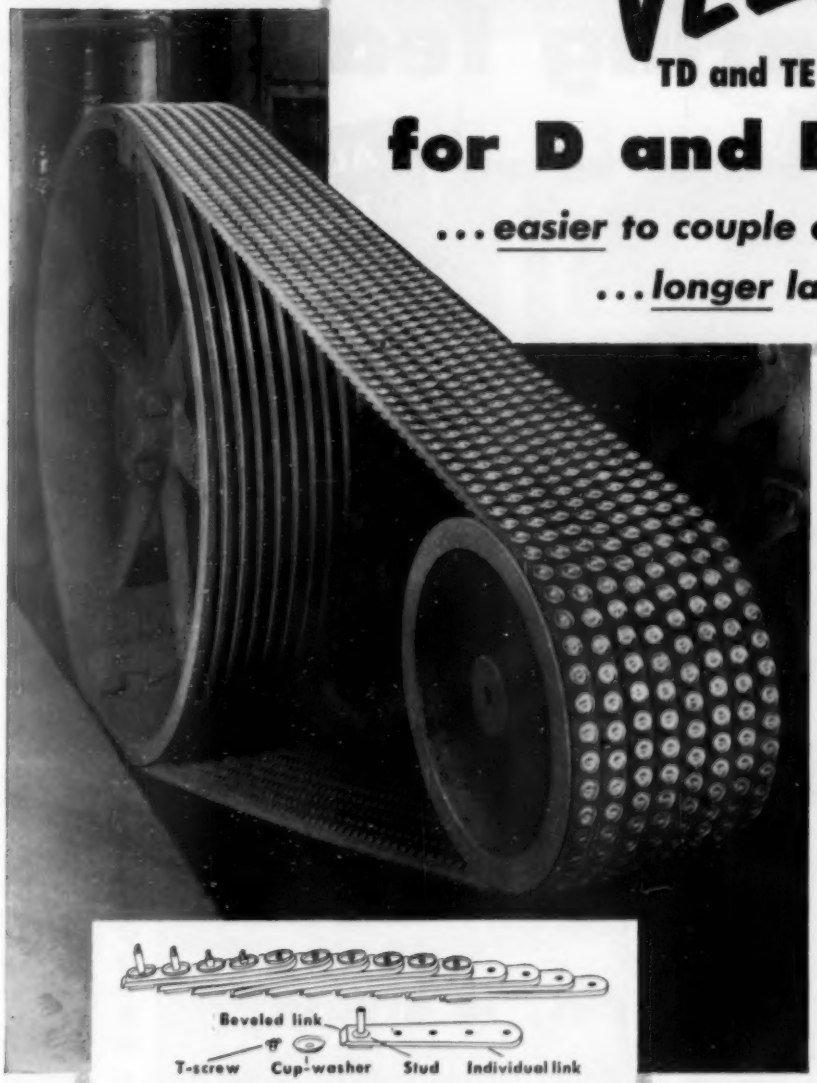
NEW VEELOS

TD and TE Adjustable V-belts

for D and E Drives

...easier to couple and uncouple

...longer lasting



This detailed line drawing of the new Veelos TD and TE v-belt makes it easy to see how this new v-belt is designed to do a better job... easier!

Now get the v-belt that's been especially developed for D and E drives—the new, patented Veelos TD and TE adjustable v-belt!

This new Veelos has advantages unmatched by any other v-belt. It is *installed quickly* without removing the outboard bearings found on most D and E drives. It is the easiest v-belt to couple and uncouple ever developed. Cup-washers and T-screws join links together to form individual belts of any length. Veelos TD and TE *lasts longer* because new high-tensile strength links plus the new stud, cup-washer and T-screw design give *added strength* —combines this added strength with *maximum flexibility* for cooler, smoother running.

Install this new Veelos TD and TE v-belt on your D and E drives. Prove to yourself why there's no v-belt that can match the performance, the efficiency and the economy of Veelos TD and TE.

Get the complete story of this great new v-belt for D and E drives. Send the coupon now for new 8-page illustrated catalog.

VEELOS
THE LINK
V-BELT

Veelos is known as Veslink outside the United States.

MANHEIM MANUFACTURING & BELTING CO.
653 Manbel St., Manheim, Pa.

Please send copy of your new Veelos TD and TE v-belt catalog.

Name.....

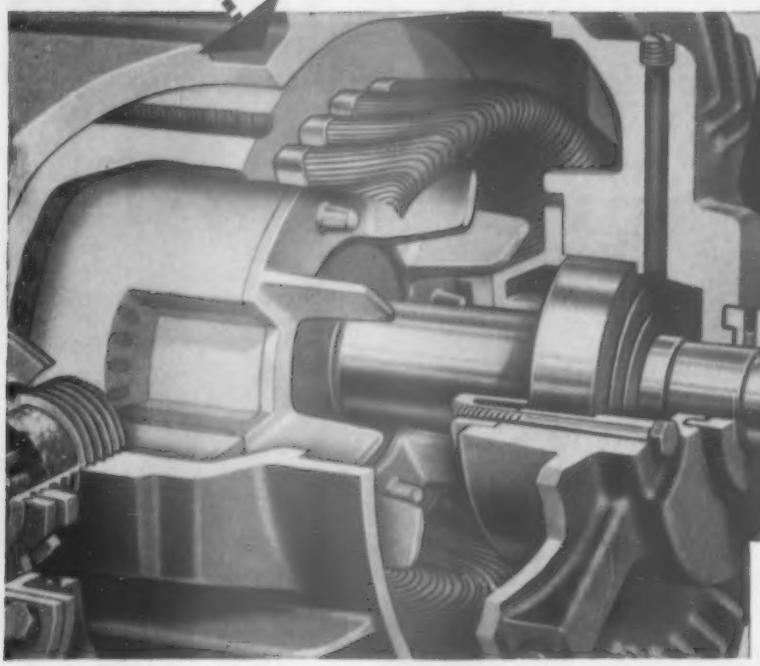
Company.....

Address.....

.....

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Get Both bearing features



fully enclosed and protected

The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

. . . yet easy to grease

You can lubricate the bearings without dismantling the motor. Pipe-tapped holes in the bearing housings at three points provide both means for inserting new grease and a means of flushing out old grease.

Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7225.

A-4609

ALLIS-CHALMERS

For fast industrial battery service...

save this map!

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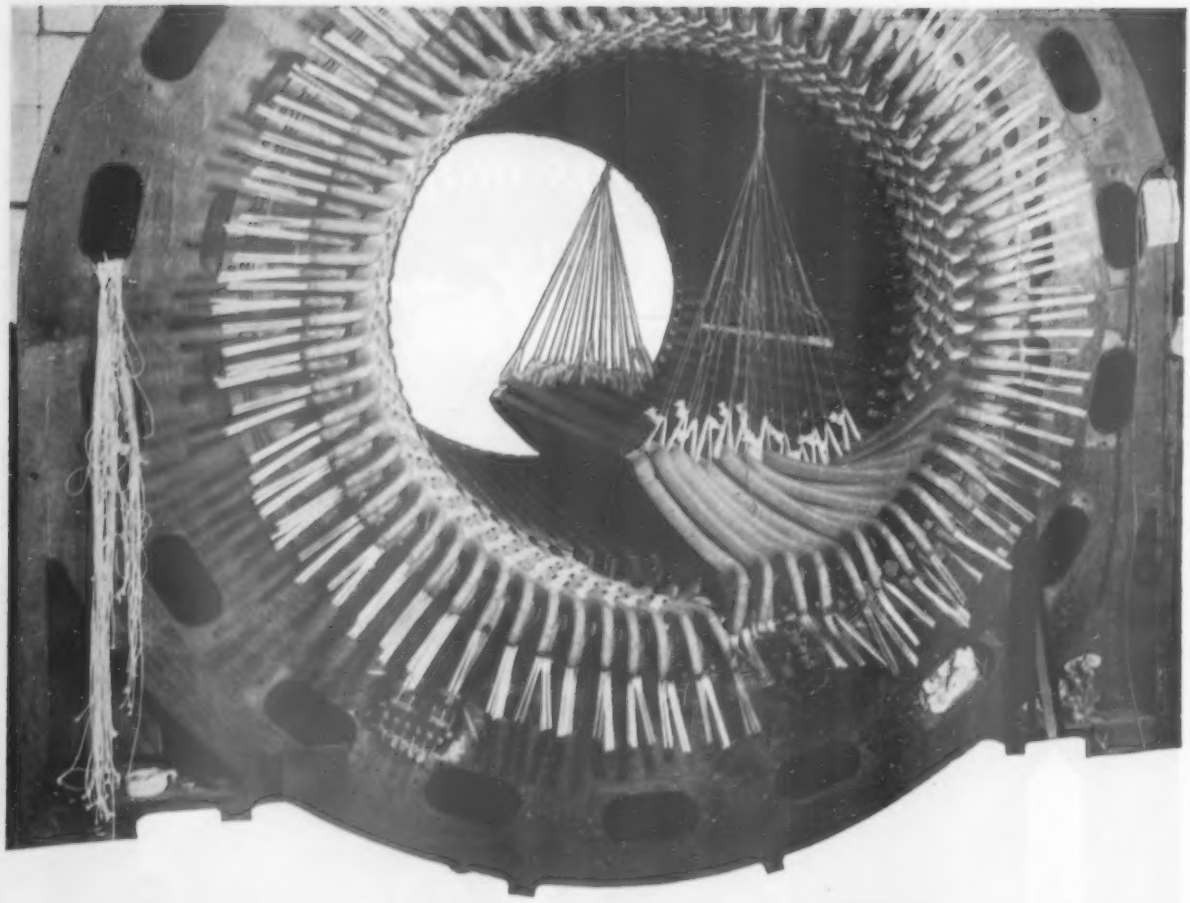
35. Tulsa, Okla., 214 East 12th St., 2-3197
36. Washington, D. C., Suite 344, Washington Bldg., National 8-1852

Wherever you may be, there is a C & D service representative nearby to serve your needs. If you have any questions concerning industrial batteries or maintenance, one of C&D's trained service representatives listed above will be glad to serve you.

C&D BATTERIES, INC.
of Conshohocken, Pa.

Industrial Batteries since 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST



WHY WESTINGHOUSE REPLACEMENT COILS MEAN BETTER THAN NEW PERFORMANCE

Now! Westinghouse exclusive Thermalastic® insulated replacement coils are available for your motors and generators. Here are new, superior coils that will greatly extend the "new life" you rebuild into your equipment. Here are coils that will upgrade and, in most cases, actually uprate your equipment.

- Void-free. Impervious to moisture, ordinary solvents, oils, weak acids and alkalies.
- Thermal stability, and voltage endurance increased at least 10 times.
- Mechanical strength increased more than 30 times; dielectric strength increased more than 20 percent.
- Extremely elastic . . . follows expansion and contraction of copper.
- Does not deteriorate with age . . . long-time storage of spare coils no problem.

Westinghouse maintains a network of 38 repair plants strategically located over the United States where Thermalastic windings are applied to motors, 200 hp and up, and generators, 150 kv and larger. Westinghouse Field Service makes thorough and lasting repairs to equipment not conveniently moved from your plant.

Contact your Westinghouse sales engineer . . . or write Westinghouse Electric Corp., 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

J-95170

YOU CAN BE SURE...IF IT'S Westinghouse

STRONGER, SAFER, STREAMLINED CONSTRUCTION

...with Phillips Cross-Recessed-Head Screws

"ASSEMBLY IMPROVED IMMEDIATELY when we began using Phillips screws," relates the assistant purchasing agent of Fasco Industries, Rochester, N. Y., leading makers of shaded pole motors, blowers, fans and ventilators. "Now we can use mechanical drivers that save plenty of time. Burring seldom happens any more. Product appearance couldn't be better. Whether inside for extra sturdiness, or outside for extra dressiness, we use Phillips screws almost exclusively!"

MORALE AND PRODUCTION SOARED with changeover to Phillips screws, which now comprise more than 92% of all screws used at Yankee Metal Products Corporation, Norwalk, Conn. Makers of auto lamps, mirrors and safety equipment since 1915, Yankee depends on many types of Phillips heads — both unplated and chromed to match accessories. Yankee's Merchandising Director says happily, "Phillips screws for extra safety, speed and ease of use really build plant morale and incentive earnings!"

EXTREME ANGLES NO PROBLEM where tightness is vital as in this fan assembly built by leading small motors manufacturer A. C. Gilbert of New Haven, Conn., to withstand lifelong vibration. Single-slot screws proved treacherous and expensive in time and damage loss. An executive engineer for Gilbert says, "Using Phillips screws for over 10 years, we have learned that, for all around production efficiency, Phillips are the best."

MANUFACTURERS OF PHILLIPS CROSS-RECESSED-HEAD SCREWS

THE FASTENERS OF TODAY
...AND OF THE FUTURE

X marks the spot

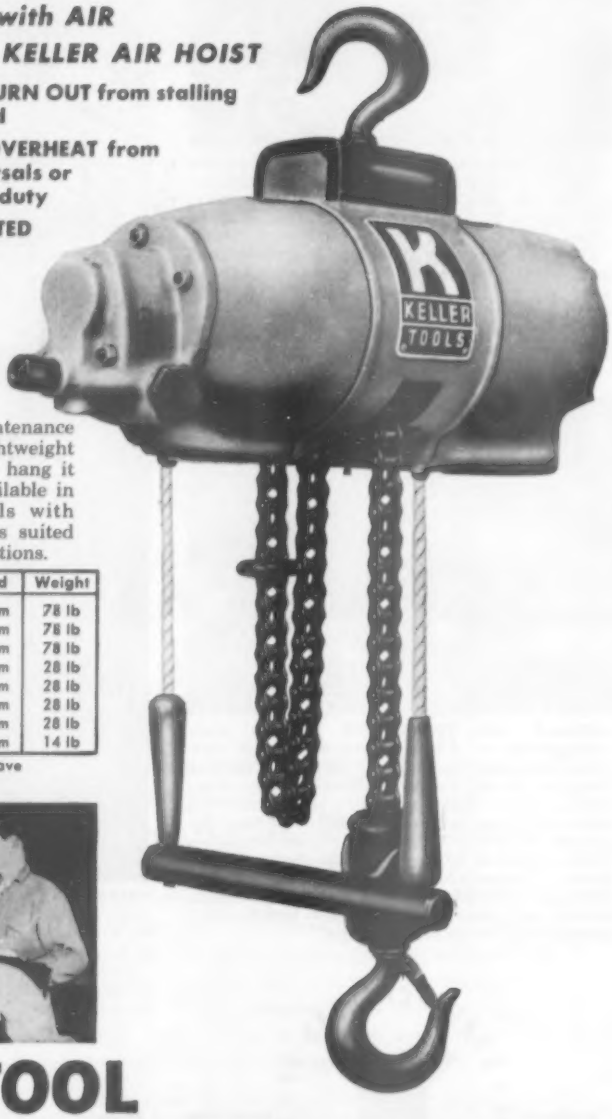
... the mark of extra quality

Allmetal Screw Products Company, Inc. • American Screw Company • Atlantic Screw Works, Inc. • The Blake & Johnson Co. • Central Screw Company • Continental Screw Company • The Eagle Lock Company • Elco Tool and Screw Corporation • Great Lakes Screw Corporation • The H. M. Harper Co. • The Lamson & Sessions Company National Lock Company • The National Screw & Manufacturing Co. • Parker-Kalon Div. General American Transportation Corporation • Pheoll Manufacturing Company Rockford Screw Products Company • Scovill Manufacturing Company • Shakeproof Division Illinois Tool Works • The Southington Hardware Manufacturing Company Sterling Bolt Company • Universal Screw Company • Wales-Beech Corporation

Are you burned up with the Cost of Hoist Maintenance?

—then Lift with AIR with a KELLER AIR HOIST

- **CANNOT BURN OUT** from stalling or overload
- **CANNOT OVERHEAT** from rapid reversals or continuous duty
- **NOT AFFECTED** by dust or fumes



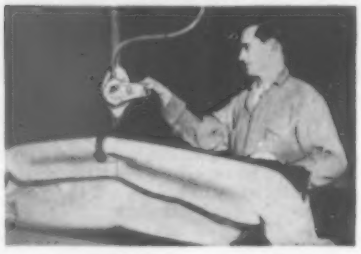
Not only are maintenance costs low, but it is lightweight so that one man can hang it unassisted. Now available in a variety of models with speeds and capacities suited to diversified applications.

Size No.	Capacity	Speed	Weight
86-2V20	2000 lb	19 fpm	78 lb
86-2V20L*	2000 lb	19 fpm	78 lb
86-2V10	1000 lb	35 fpm	78 lb
86-1V10	1000 lb	19 fpm	28 lb
86-1V10L*	1000 lb	19 fpm	28 lb
86-1V5A	500 lb	35 fpm	28 lb
86-1V3	300 lb	80 fpm	28 lb
86A-1 †	150 lb	40 fpm	14 lb

* Link chain hoists—others have roller chains. † Cable hoist.

Versatile New 86A-1 Air Hoist Saves Backaches and Strains

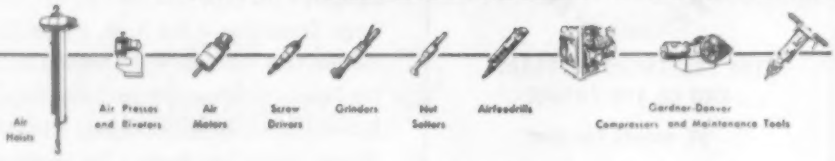
With this new hoist you can handle loads up to 150 lb effortlessly . . . avoid the strains of heavy lifting. Built-in push button control makes it as natural as lifting by hand. Ask for special Catalog 86B.

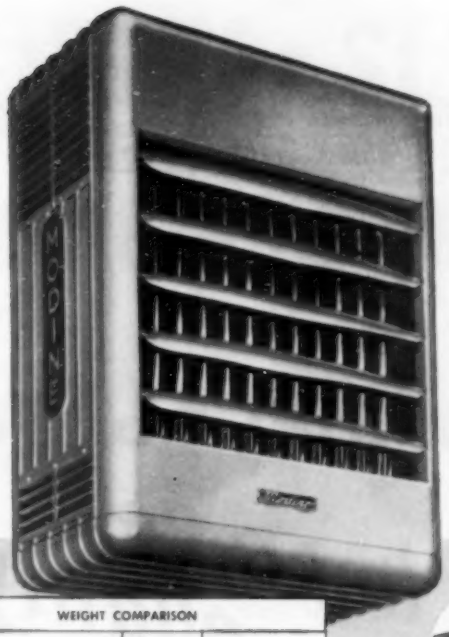


KELLER TOOL

DIVISION OF **GARDNER-DENVER**

GRAND HAVEN, MICHIGAN





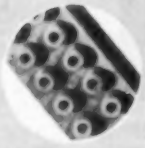
ONLY Modine Gas-Fired Unit Heaters give you all these advantages

• No other manufacturer offers you rust- and corrosion-resistant stainless steel burners as standard equipment . . . plus a choice of aluminized or stainless steel heat exchangers. And there are many other features for reduction of overall costs. In many instances, for example, the savings a Modine Unit Heater allows in installation costs alone offset any difference in price.

WEIGHT COMPARISON		
Brand	Capacity (Btu/hr. input)	Approx. Net Weight
Modine (aluminized steel)	105,000	105
Modine (stainless steel)	105,000	95
Brand "A"	100,000	170
Brand "B"	102,000	196
Brand "C"	90,000	175
Brand "D"	100,000	165
Brand "E"	100,000	210
Brand "F"	100,000	210
Brand "G"	105,000	170

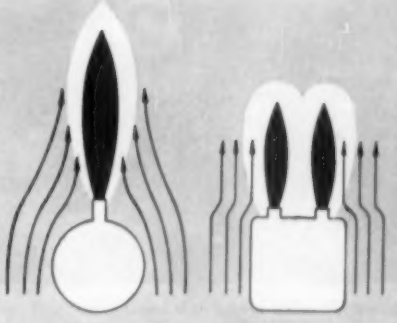
Lower shipping, installation costs

Light weight, without sacrifice of strength or efficiency, makes Modine Unit Heaters easier to handle, faster to install. Also cuts need for expensive support structures.



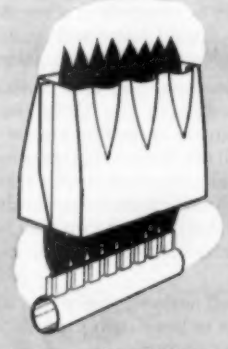
No port clogging, cleaner burning

Self-cleaning Modine burner ports have four times the free area of conventional drilled ports. Knife-sharp edges prevent lodging of scale.



More usable heat per fuel dollar

Single-row burner ports promote adequate secondary air supply. As a result, you get maximum combustion efficiency, more heat for your fuel dollars.

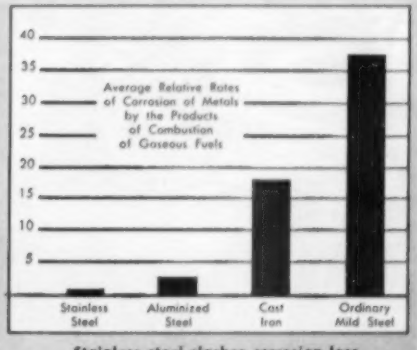


Faster, more uniform heating

Continuous flame from front to rear of individually fired exchangers, increases radiant heat absorption, uniformly distributes heat through tube.

Easy access for inspection or service

Hinged casing swings down, reveals burners, manifold and pilot light. Complete burner assembly may be removed as a unit.



Stainless steel slashes corrosion loss

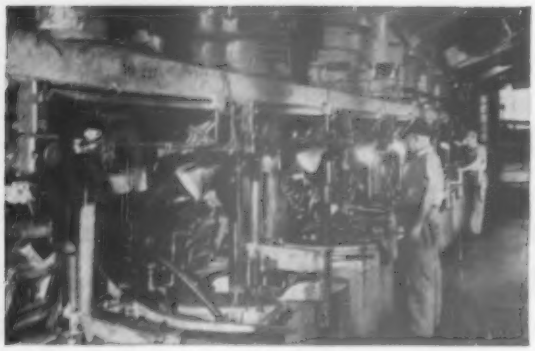
Modine burners, to all practical purposes, are unaffected by acid corrosion, rusting and scaling (see chart) . . . give you many years of trouble-free, top efficiency.

Modine UNIT HEATERS

NEW 12-PAGE BULLETIN 655

gives you more complete information, selection and application data. Call the Modine representative listed in your classified phone book. Or write —Modine Mfg. Co., 1505 Dekoven Ave., Racine, Wisconsin, for your copy.

GU-1257



Protecting syrup against carmelizing *at American Molasses Co. is the responsibility of Honeywell temperature and pressure controllers working with a* ***Modutrol*** *valve. The controllers are interlocked so that burning in the heater is prevented, and product quality is safeguarded.*

Honeywell Controller Cost—$215.00

Honeywell Industrial Controls

Air-conditioning bread as it cools *helps the Continental Baking Co., Portland, Oregon, to protect palatability. Honeywell Proportioning Temperature Controllers and Humidistat regulate sprays and air dampers to keep conditions right.*

Honeywell Controller Cost—$50.00

Plating solutions *are held at correct temperature for best quality of finished electrotypes, at the Kingsboro Electrotype Corp., Brooklyn, N. Y. . . . by means of Honeywell Remote Bulb Controllers.*

Honeywell Controller Cost—$29.00

improve quality

Don't overlook these simple, low-cost controllers...they're the ideal solution to hundreds of problems.

In practically any plant, there are dozens of spots where simple, inexpensive Honeywell Industrial Controls can be put to work to improve the quality of production. The examples pictured here give only a few of the ways that this versatile family of controls can regulate temperature, pressure, vacuum, liquid level and humidity . . . the variables that directly affect quality of finished goods.

For your specific application, you can choose from more than 7000 different models in the Honeywell Industrial Controls line. All are simple in design, rugged in construction, modest in price. All are backed by the precision manufacturing know-how and extensive application experience of the world's largest manufacturer of controls. In addition to improving quality, these controls can also be relied on to increase production, reduce maintenance, increase safety and cut costs.

Ask your local Honeywell sales engineer to discuss how you can apply these controls in your own plant. Call him today . . . he's as near as your phone.

Minneapolis-Honeywell Regulator Co., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

Also manufacturers of a complete line of precision measuring, recording and controlling instruments.

MINNEAPOLIS **Honeywell**

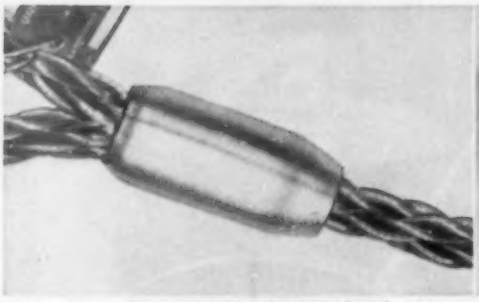
BROWN INSTRUMENTS

First in Controls

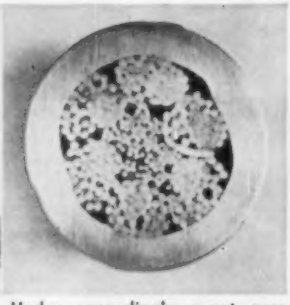
Tuffy® SLING NEWS

Vol. 1 Published Monthly in Leading American Trade Magazines by Union Wire Rope Corp. No. 1

DOUBLE GOOD NEWS ABOUT SLINGS



A heavy walled, streamlined steel ferrule is pressed on over tucked eye splice of Tuffy machine braided wire fabric from which sling is made.



Under exceedingly great pressure, the metal of the ferrule is flowed into fabric interstices.

Tuffy Makes Sling History Again With New Ferrule

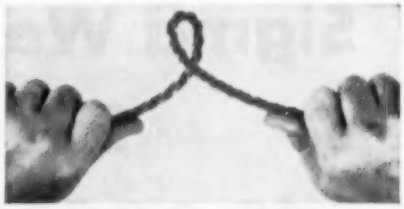
Tuffy Slings upset sling history quickly when introduced. The patented machine braided Tuffy Sling fabric has been upsetting sales and service records ever since.

Now, Tuffy Slings are making history again with a streamlined metal ferrule squeezed on over tucked eye splices so tightly that the eye splice has strength equal to that of the machine braided wire fabric. It makes Tuffy Slings stronger and safer. The ends of the tapered ferrule are swaged tightly to the fabric leaving no edges to hang up on loads or to injure workers' hands in hitching to and unhitching from loads. This, coupled with the great flexibility of Tuffy machine braided sling fabric, makes Tuffy Slings the handler's favorite.

High Strength of Famous Tuffy Machine Braided Flexible Wire Fabric Equalled in Eye Splice

Tuffy Slings' unusual resistance to kinking and the ease with which kinks are straightened out without damage to strands has piled up sling savings through longer service life.

Now, more advantages, bigger values are added to Tuffy Slings. Eye splices are made as strong as sling fabric with steel ferrule pressed on under great pressure over eye splice tucks. It's streamlined with ends tapered smoothly to fabric for safer, easier, faster hitching and unhitching on loads.



Your Tuffy Distributor Saves You Money!

Tell him what your future requirements might be. He'll keep a good stock for you to draw against. Call him soon. He's the man who can supply the biggest value in Tuffy Slings and Tuffy Hoist Lines to team up with your Tuffy Slings.

New Edition of Tuffy® Sling Handbook FREE — Mail Coupon Now

This new 60-page Sling Handbook is a completely revised edition of the famous Tuffy book that first made sling news several years ago. The new edition shows you why Tuffy's new tuck splice and pressed-on ferrule can speed up sling-loading work, improve safety records. It contains complete information about a full line of factory-fitted Tuffy Slings, nearly a dozen new standard fittings available, and complete data and charts on all Tuffy Slings. It also has a brand new engineer's notebook and a valuable rigger's manual.

Get FREE Sling Handbook Mail Coupon Today

We just want you to see what a difference the new Tuffy ferrule and tucked splice make. We want you to have the advantages of this big, fully illustrated and charted sling guide. No obligation. Write now.

union Wire Rope corporation

Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand.

2234 Manchester Avenue, Kansas City 26, Missouri

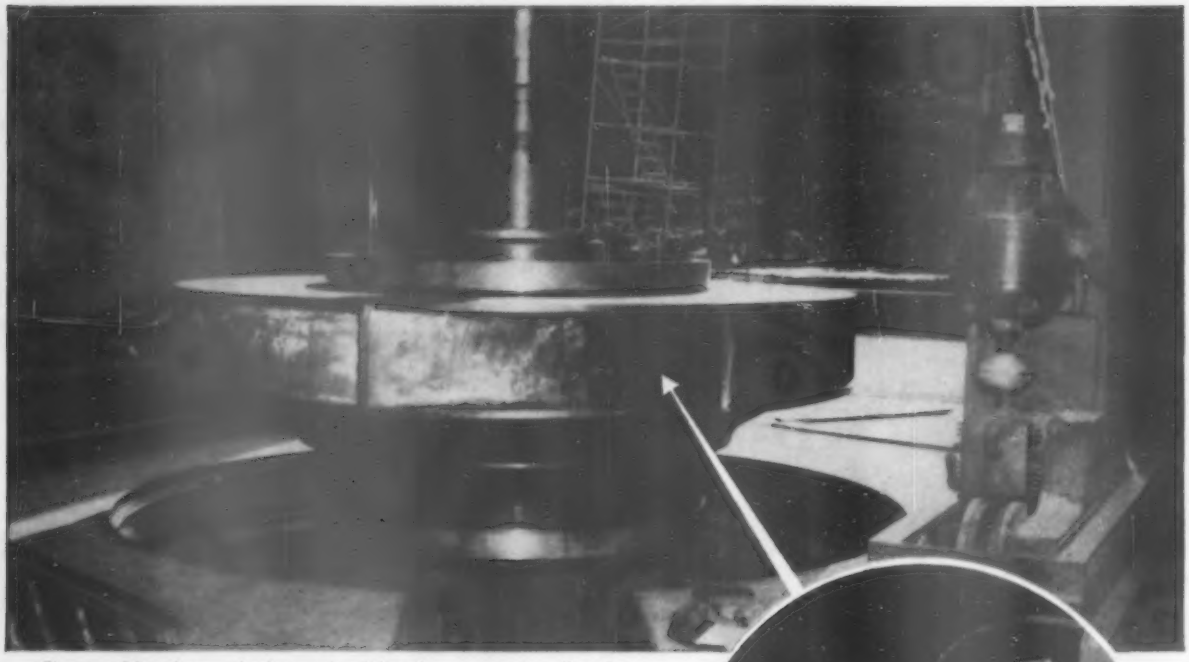
MY NAME_____ TITLE_____

COMPANY NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

12



Sigma welding has made the repair of these large pump impellers faster and more economical. Finished welds are a sound, homogeneous bond.

Sigma Welding Saves $5,000 per unit

Speeds repair of world's second largest pumps . . .

During operation, giant 20 ton manganese bronze pump impellers like this one, suffer cracks ranging in size from small sand inclusions, to cuts over a foot long. By using sigma welding, it is now possible to make high quality, on the spot repairs without disassembling the units — this results in an immediate savings of 5,000 dollars per pump.

Shown above is a typical repair operation on one of the 22,000 hp. electric motor driven pumps. This crack is 11-in. long, 2½-in. wide, and 2-in. deep. The four pegs adjacent to the crack are strain check points. Frequent measurements made of the distance between them determines welding duration and the peening sequence necessary to control distortion which in this operation was less than 0.005 inch. The completed weld made with aluminum bronze wire has an excellent surface appearance and color match.

You can speed production and cut costs in your operations—find out more about sigma welding from your local LINDE representative . . . Start saving now, call him today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

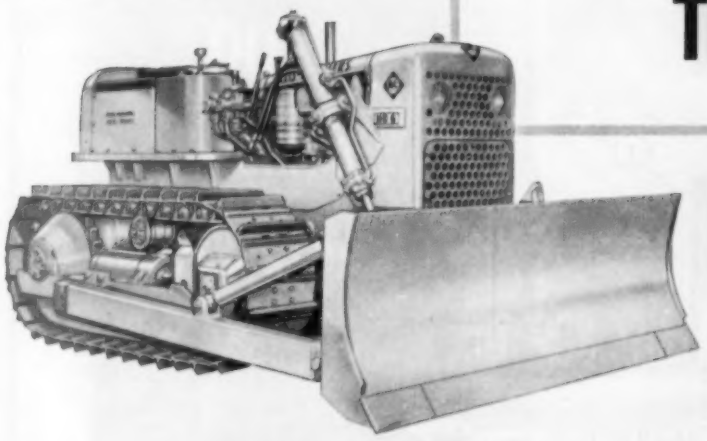
Linde
Trade-Mark

more performance
FOR SUSTAINED HIGH OUTPUT!

more versatility
FOR A WIDER RANGE OF WORK!

more dependability
FOR LOWER JOB COSTS!

ALLIS-CHALMERS ANNOUNCES TWO NEW HD-6 SERIES TRACTORS



HD-6 BULLDOZER-DRAWBAR TRACTOR

Weight	12,400 lb
Drawbar hp	45
Belt hp	55

STEP UP PERFORMANCE, CUT JOB COSTS WITH EXCLUSIVE HD-6 FEATURES LIKE THESE . . .

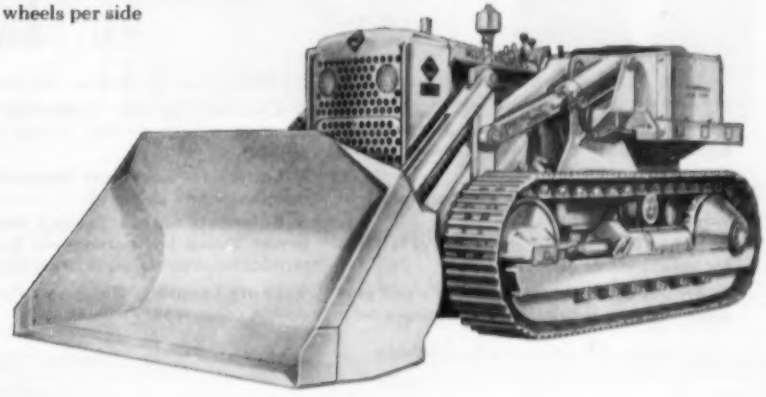
- Allis-Chalmers heavy-duty diesel engine
- Long-wearing ceramic master clutch lining
- All-steel box-A main frame
- One-piece steering clutch and final drive housing
- Double reduction final drives
- Roller bearing truck wheels
- Welded steel truck frames
- Tru-Dimension tracks
- 24-volt direct electric starting
- Unit construction
- 1,000-hour lubrication intervals
- Engine-mounted bulldozers

. . . PLUS TRACTOR SHOVEL FEATURES LIKE THESE . . .

- Extra-long track with six truck wheels per side
- New two-position bucket
- Heavy-duty shovel assembly
- Simple, safe hydraulic system
- Two-speed reverse

HD-6G TRACTOR SHOVEL

Weight	19,600 lb
Drawbar hp	45
Net engine hp	57
Bucket capacity	1-1/3 cu yd



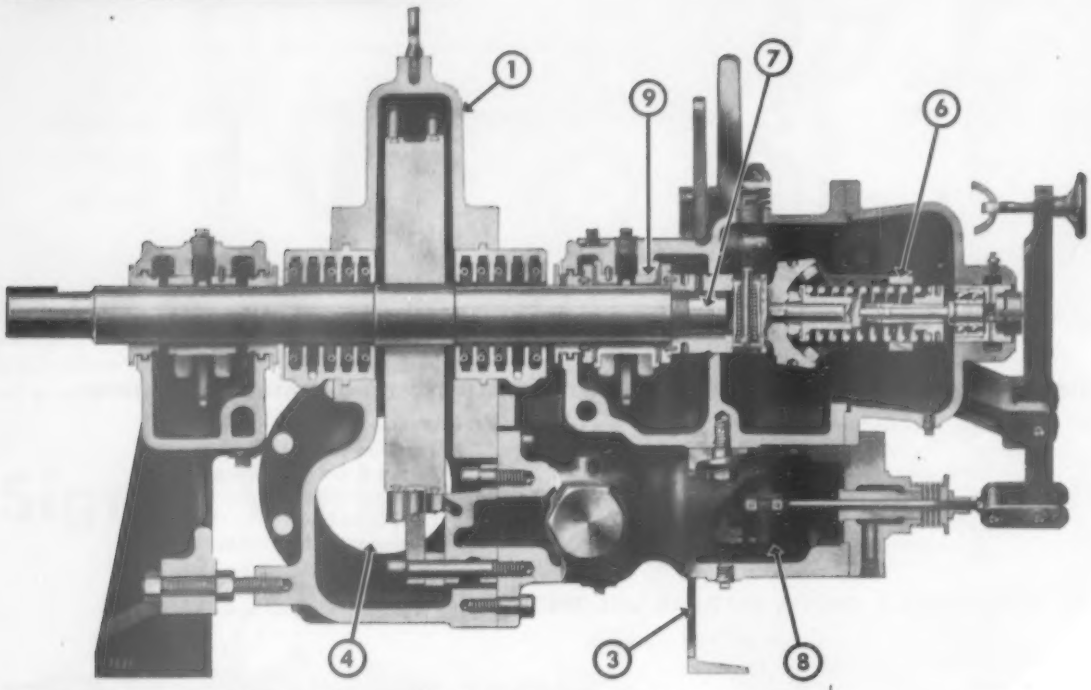
GET ALL THE FACTS NOW FROM YOUR NEARBY ALLIS-CHALMERS DEALER

CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

NEW DE LAVAL HCB SINGLE STAGE TURBINE

can be ordered from stock



1 Case and Cover Split Horizontally on centerline for ease of maintenance.

2 True Centerline Casing Support assures distortion-free radial expansion. *Not shown.*

3 Flexible Support at governor end provides for axial expansion.

4 Exhaust Opening either right or left side for installation flexibility.

5 Steam Strainer, protecting trip and governor valves, is *removable* for cleaning without breaking steam connections. *Not shown.*

6 Constant Speed Governor features governor weights pivoted around frictionless surfaces.

7 Complete Governor Assembly is now *replaceable as a unit.*

8 Balanced Single Seated Main Governor Valve has proportional flow characteristics for sensitive, positive control.

9 Shaft Locating Bearing of adjustable double collar type.

Horsepower: 100 MAX
Steam Pressure: 300 PSIG MAX
Steam Temperature: 550F MAX
Exhaust Pressure: 25 PSIG MAX
Speed: 4,000 RPM MAX
Steam Inlet: 2"–250# ASA FLG.
Exhaust: 6"–150# ASA FLG.
Weight: 1,200 LB

Here's the new De Laval HCB Single Stage Turbine which is now "on the shelf" . . . ready for immediate shipment. This mechanical drive turbine is simple, rugged, designed for long economical life and low maintenance. For example, note the true centerline casing support, the replaceable governor, the removable steam strainer. Investigate all the advantages of this versatile driver. It is ready to handle—*at low cost*—a variety of applications in your plant.

Send for new Bulletin 4206
which gives vital facts and figures

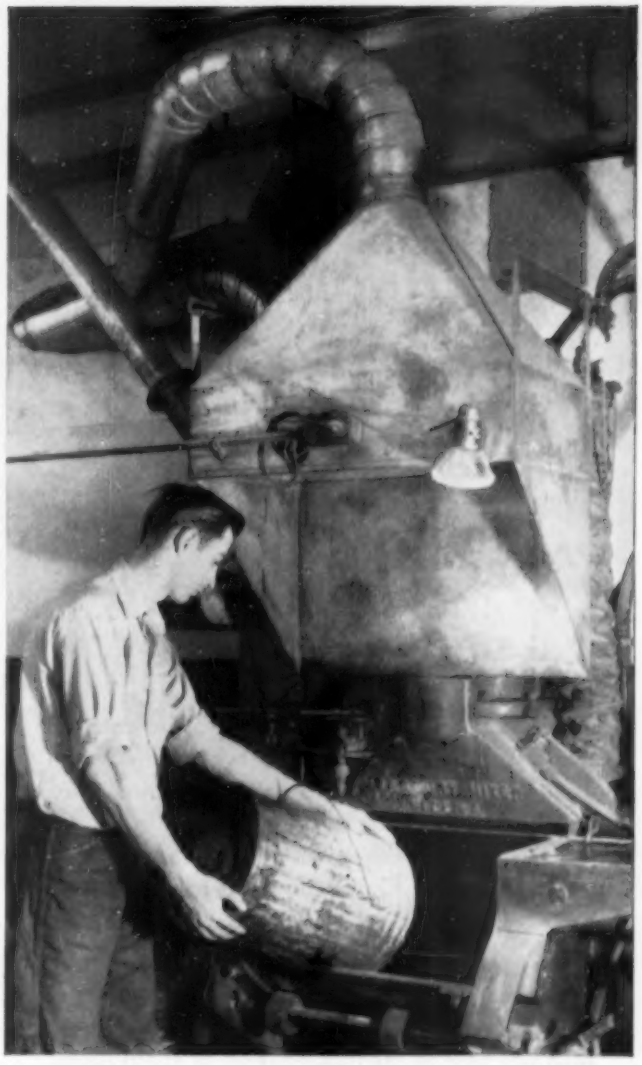
DE LAVAL *Mechanical Drive Turbines*

DE LAVAL STEAM TURBINE COMPANY
804 Nottingham Way, Trenton 2, New Jersey

DL209

TURNING DUST from a PROBLEM to a PROFIT

Wheelabrator® **DUSTUBES**®
save $10,000 yearly
for Lord Mfg. Co.
ventilating Banbury Mixers



Lord Mfg. Co. of Erie, Pa., operates two Banbury mixers to mix carbon black, sulphur and other materials with rubber stocks.

Hoods over the hopper, oven hopper, exhaust bearings and exhaust discharge gate of each Banbury keep carbon black and other material from escaping into the air.

Because this material is collected in the dry state by the cloth filter tubes in two Wheelabrator Dustube Collectors it can be returned to the batch. Savings of $10 to $15 per mixer per 8 hour day are achieved.

Besides the savings, however, the return of the material insures proper mixture throughout the batch cycle and maintains the quality of the batch.

In addition, the Dustube Collectors simplify housekeeping and establish better working conditions in the department.

Investigate the many benefits of Wheelabrator Dustube Collectors. Send today for Bulletin 372.

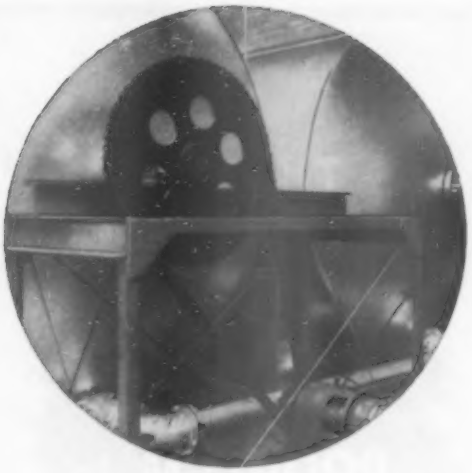
WHEELABRATOR
CORPORATION
(Formerly American Wheelabrator & Equipment Corp.)

374 S. Byrkit St., Mishawaka, Indiana

Trail Blazer of Industrial Progress

DIAMOND ROLLER CHAIN DRIVES

to keep your production UP!



From motor to driven shaft, one shaft to another or several,—you will find smooth running, non-slipping Diamond Roller Chain in the pitch size, length, single or multiple strand—that will solve the problem, maintain 98-99 per cent efficiency and 100 per cent speed ratio.

Your production is maintained at the level desired, with no unnecessary time out for adjustments or frequent repairs . . . You can make greater use of Diamond Roller Chain now than you have in the past,—plenty of applications that will further improve your overall output economically.

Stock Roller Chains and Sprockets are carried by Diamond Distributors all over the country—for handy reference write for Stock Catalog 754.

DIAMOND CHAIN COMPANY, Inc.

Where High Quality is Traditional

Dept. 449, 402 Kentucky Avenue, Indianapolis 7, Ind.

Offices and Distributors in All Principal Cities

Please refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

STOCK CHAINS & SPROCKETS

Write for Catalog 754 Stock Roller Chains and Sprockets

CONTENTS INCLUDE:

- How to select Stock Roller Chain Drives
- Ready-to-use chain length tables
- Table of speed ratios for sprocket combinations
- Sprocket selection tables for chains, all pitches
- Stainless Steel and Bronze chains

The Roller Chain is DIAMOND

TRADE ◇ MARK

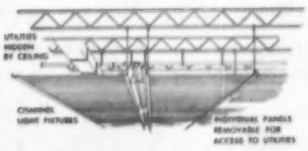
Station #304 of the Texas Illinois Natural Gas Pipe Line Co., Marshall, Texas

Another Serious Noise Problem solved with ReynoCoustic

The gas engine-compressor units used in pipe line stations make a terrific noise. Equipment operators subjected to its full force would suffer seriously in comfort and efficiency. The Texas Illinois Company sought the best solution – found it in ReynoCoustic.

This aluminum acoustical system combines maximum sound absorption with long life and minimum maintenance. It has an excellent fire spread rating – Underwriters' Laboratories label on each shipment.

The installation shown is so successful, the Texas Illinois Natural Gas Pipe Line Co. is using ReynoCoustic in seven more stations. Consider this superior treatment wherever you have a noise problem.



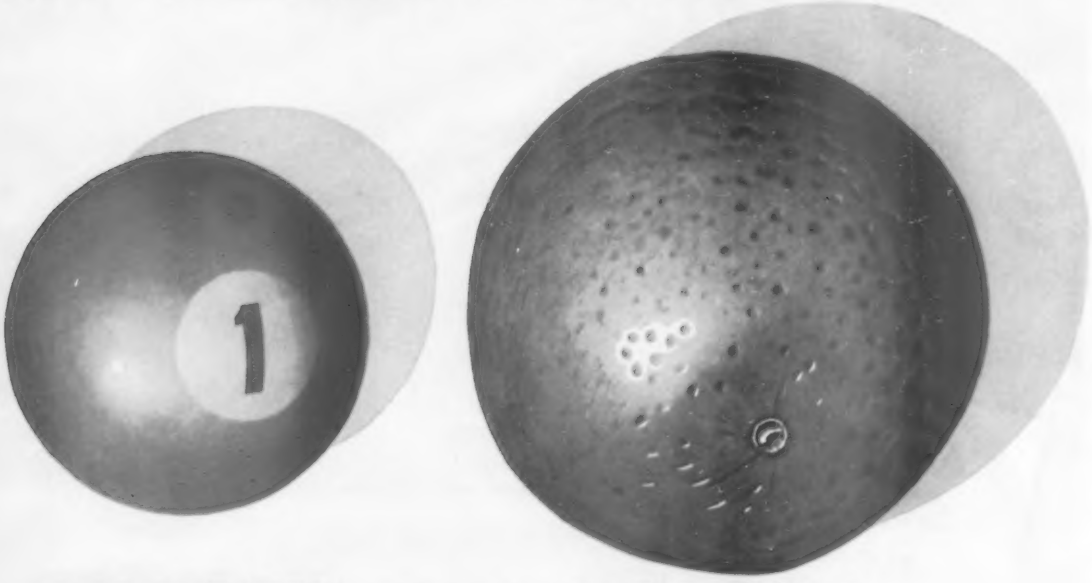
In the pipe line station, ReynoCoustic panels were laid on roof girders. Above is a more typical installation – panels laid horizontally on T channels, forming a suspended ceiling with ready access to utilities above. Noise reduction up to .90, uniformly high at all frequencies.

A complete installation service is available. For name of nearest franchised acoustical applicator, call the Reynolds office listed under "Building Materials" in classified phone books of principal cities. For complete literature write to Reynolds Metals Company, Building Products Division, 2007 South Ninth Street, Louisville 1, Kentucky.

REYNOLDS ALUMINUM
BUILDING PRODUCTS

See "FRONTIER," Reynolds new dramatic series, Sundays, NBC-TV Network

Vina-Lux® FLOORS ARE EASIER TO CLEAN BECAUSE THE SURFACE IS



SMOOTH NOT POROUS

Because Vina-Lux vinyl-asbestos tile has a super-smooth, non-porous surface, dirt, grease and grime don't wear in —they can't *get* in. This modern flooring cleans easily without hard scrubbing—and it's easier to ***keep clean*** without waxing. This can mean substantial savings in the maintenance budget of *your* plant.

You get much more however than just lower maintenance costs when you use Vina-Lux. Here is a floor that can stand up to the rolling friction of material handling trucks. A product that will not splinter or abrade away from dropped tools or heavy usage. Here is a product that fights grease, defies alkali and stubbornly resists acids—a product especially suited to solve factory floor problems. A floor that can take concentrated foot traffic and the abuses common in manufacturing plants—that's easier on the feet, non-slip and safer to walk and work on.

Vina-Lux—America's leading vinyl-asbestos tile—can help you solve the floor problems of *your* plant—and do it at a cost per square foot per year that will surprise you. Write today and ask us for all the data on this remarkable flooring.

AZROCK PRODUCTS DIVISION • UVALDE ROCK ASPHALT CO.
FROST BANK BUILDING • SAN ANTONIO, TEXAS • *MAKERS OF* VINA-LUX • AZROCK • DURACO • AZPHLEX

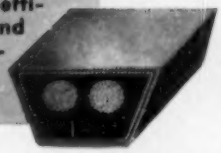
AZROCK FLOORING PRODUCTS

TEXROPE
Greatest Name in V-Belt Drive

The Only Complete Line of Variable Speed V-Belt Drives

Texrope Fixed-Speed Drives

For transmitting power efficiently between motor and load where speed variation is not required.



Texrope Grommet Belts

This heavy-duty construction gives from 30% to 50% longer life at no extra cost. The grommet is endless, eliminating the stiff overlap that sets up strains and causes eventual breakdown in ordinary belts. Oil-resisting and static-conducting belts also are available.

Magic-Grip Sheaves

Designed for fast, easy mounting and dismounting. You simply slip the assembled unit on the shaft, slide it to the desired position and tighten the screws which clamp the split tapered bushing on the shaft. The result is safe, smooth-running performance.

Stationary Control *Vari-Pitch* Sheave

where speed changes are infrequent and machine can be stopped to make the change.

9% to 38% Speed Variation

One *Vari-Pitch* sheave and one fixed-diameter sheave are used to get this speed variation. Here's the low-cost way of providing variable speed. No need for high-cost special motors or electrical control. Takes only a few minutes to alter pitch diameter to change speeds.

To 196% Speed Variation

Two *Vari-Pitch* sheaves — one on the driver shaft and one on the driven shaft — can greatly increase the range of speed variation. *Vari-Pitch* sheaves provide long-lasting, dependable performance, plus accurate speed control.

Motion Control *Vari-Pitch* Sheave

for applications where frequent changes must be made while drive is in motion.

Single motion-control type for speed variations to 38%. Simply turning a handwheel provides positive speed change using motion-control *Vari-Pitch* sheaves. Handwheel actuates adjusting mechanism to change sheave pitch diameter and adjust belt tension by moving motor base.

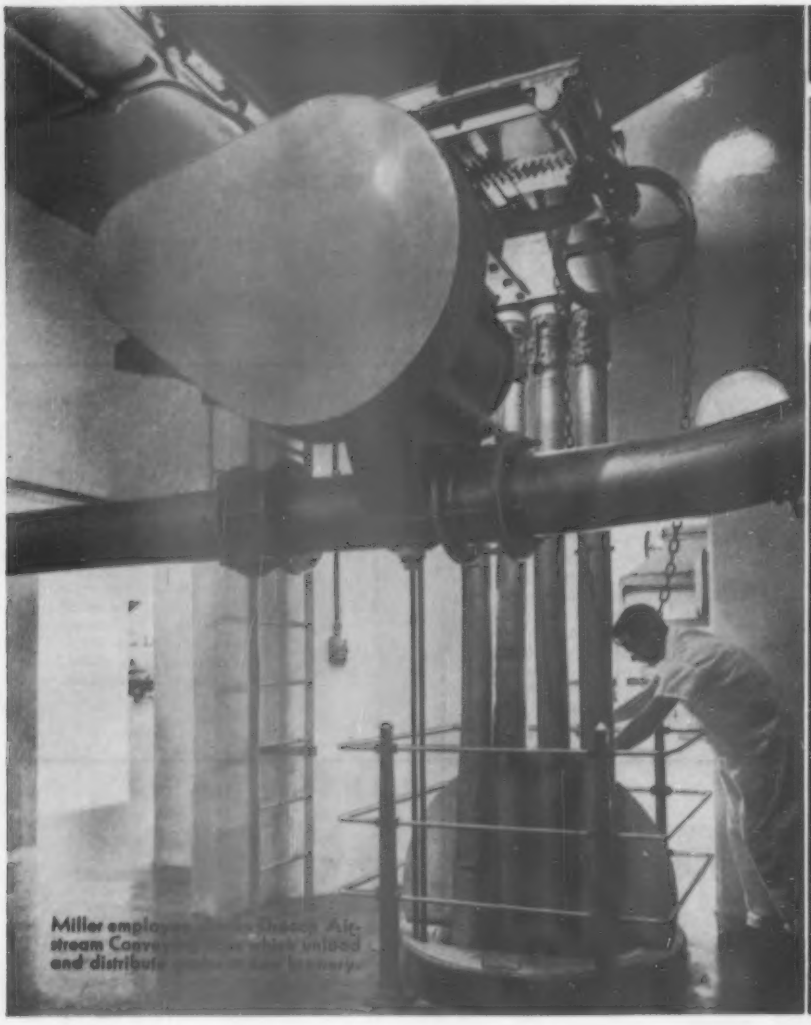
Double motion-control type for speed variations to 196%. Motion-control *Vari-Pitch* sheaves can be used on both driven and driver shafts. In this case changes in pitch diameter of motor sheave are offset by an opposite change in the driven sheave — thus maintaining constant belt tension.

Texrope, Magic-Grip and *Vari-Pitch* are Allis-Chalmers trademarks.

For further information ask your Allis-Chalmers Distributor or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin

ALLIS-CHALMERS

A-4845



65-minute boxcar unloading

0 min.—unloading starts on 51 tons of malt. Safe, clean air conveying is used.

45 min.—2 men easily unload with 4 nozzles. Telescopic hoist moves lines.

65 min.—all malt moved to 9th floor storage and car clean-up completed.

High-capacity Handling at *Miller* Brewery

102,000 pounds of malt are unloaded in 65 minutes . . . grains are rushed from storage to process at 10 tons per hour—both take place in completely enclosed systems that are dust-free, contamination-free, self-cleaning.

Modern, efficient handling like this takes place at the greatly enlarged Milwaukee brewery of the Miller Brewing Co. And as in many plants, Dracco Airstream Conveyors are responsible for this high-capacity but low-cost handling.

Four unloading nozzles guided by two men suck malt out of 5 boxcars a day and shoot it 200 feet skyward to storage. Despite high conveying speeds, Miller's requirements which permit virtually no malt breakage are being met. When needed for production, dual distribution systems move malt and grits without mixing to process.

Throughout industry, Dracco Airstream Conveyors are compiling impressive records in handling dry, bulk granular or powdered materials. Labor costs are cut with automatic systems, dollars are saved thru bulk purchasing, contamination and waste are avoided, dust and cleanliness problems are eliminated, maintenance is negligible and plant safety is improved.

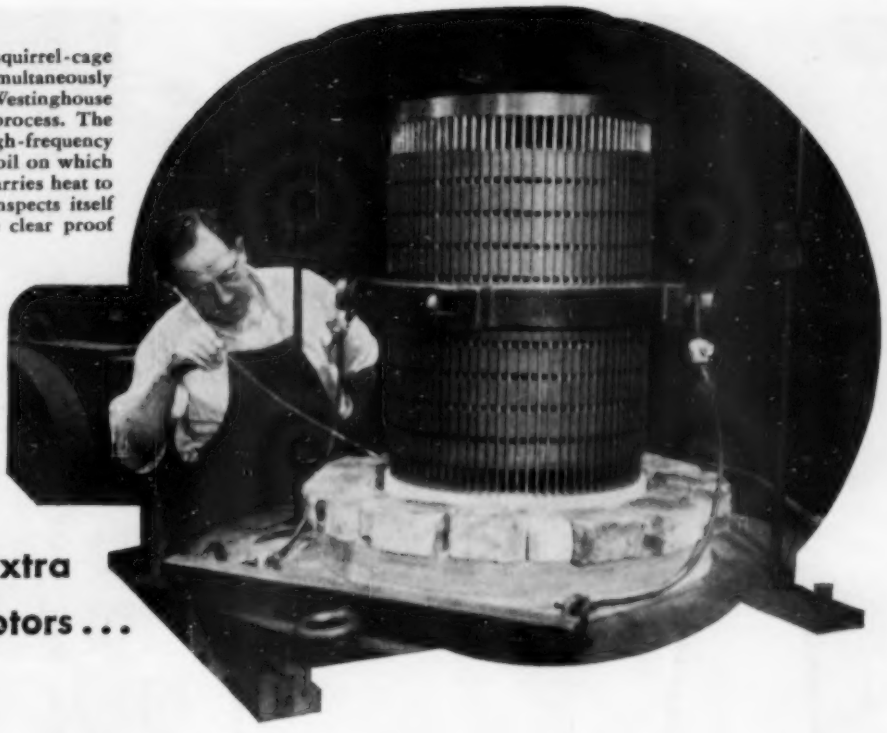
If you handle dry, bulk materials, doesn't this suggest a better way to do it? Dracco engineers will supply complete information at your convenience. Write or phone.

DRACCO CORPORATION
4075 East 116th Street • Cleveland 5, Ohio

The economies and advantages of the Dracco "Airstream" method are presented in Bulletin 529. A copy will be sent you on request.

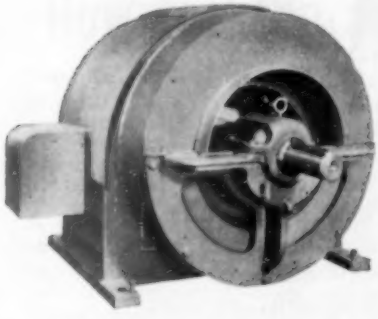
DRACCO *Performance Proved*
Airstream CONVEYORS · DUST CONTROL EQUIPMENT

All of the bars of this squirrel-cage rotor are being joined simultaneously to one end ring by the Westinghouse high-frequency brazing process. The end ring is heated by high-frequency currents induced by the coil on which it rests, and conduction carries heat to the bars. This process inspects itself . . . the red-hot bars are clear proof of positive joints.



A big extra in large motors . . .

Westinghouse special brazing process boosts rotor reliability, slashes maintenance



This is a large standard type CSF drip-proof motor. It can easily be modified to meet any special mechanical-drive requirement.

High-frequency brazing eliminates rotor joint failure . . . proved on over 1500 motors operating up to five years without a single failure

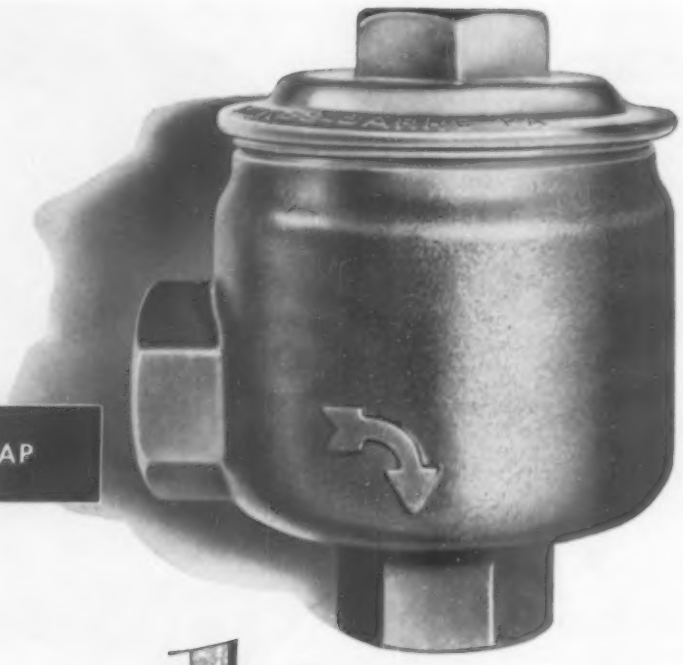
This technique licks the biggest single trouble spot in rotors of large motors. Bars are brazed to the end rings—and connections are tested at the same time. It is the only way to get solid, indestructible joints . . . your positive assurance of reliable operation under the toughest conditions.

You get many important extras in Westinghouse large motors. Thermalastic® insulation, for example, gives over 20% increase in dielectric strength, 10-to-1 increase in voltage endurance—withstands moisture, dust and corrosive atmospheres.

Both of these features have been extensively proved in service. They give you a motor far superior in performance and long life . . . the closest you can come to a completely maintenance-free mechanical drive. For full range of sizes and application assistance, call your local Westinghouse sales engineer, or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-10444

YOU CAN BE **SURE**... IF IT'S

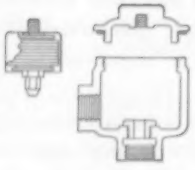
Westinghouse



STEAM TRAP

Quality

Just 3 quality parts—thermostatic bellows, body, cap. Simple, positive action. Won't leak!



Nicholson quality . . . that gives you the extra strength, extra capacity, extra *stamina* required for severest plant service. Nicholson quality pays off, when it comes to discharging condensate and air from steam lines . . . most efficiently, dependably, economically.

- **Powerful valve action—big husky bellows.**
- **Positive shut-off—finely ground valve and seat.**
- **High capacity—large diameter orifice.**
- **Rigidly tested—on actual steam lines.**

When less than best won't do, specify Nicholson. Send for *Catalog 953*.

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How to keep an inner tube together at the seams

Freezing an inner tube? Oddly enough, that's what the man in the picture is doing. He's hardening a freshly formed seam so it will hold together in the vulcanizer.

Key units in the production of inner tubes at Carlisle Tire and Rubber Company of Carlisle, Pennsylvania, are four "Freon"* charged refrigerating systems. Contact with a "Freon" filled pipe at 20°F. for a few minutes strengthens the butt splice of an inner tube.

"Our York refrigerating systems give us the efficiency, safety and economy we need at Carlisle," says Mr. Kaebnick, Chief Plant Engineer. "By efficiency I mean close temperature control—safety, no health hazard from a refrigerant leak. Economy shows up in low maintenance costs and little production loss due to repairs."

Modern refrigeration has solved many production problems. "Freon" refrigerants are ideal for industry, because they are nonflammable, nonexplosive and virtually nontoxic. For nearly 25 years Du Pont has been manufacturing "Freon" to exacting laboratory standards—insuring continuous top quality and uniformity.

Perhaps refrigeration can help you improve quality and cut costs. You will find profitable information in Du Pont's booklet "How Air Conditioning and Refrigeration Benefit Industry." Clip out and mail the coupon below. See what air conditioning and refrigeration can do for you.

"FREON"
SAFE REFRIGERANTS

*"Freon" is Du Pont's registered trade-mark for its fluorinated hydrocarbon refrigerants.

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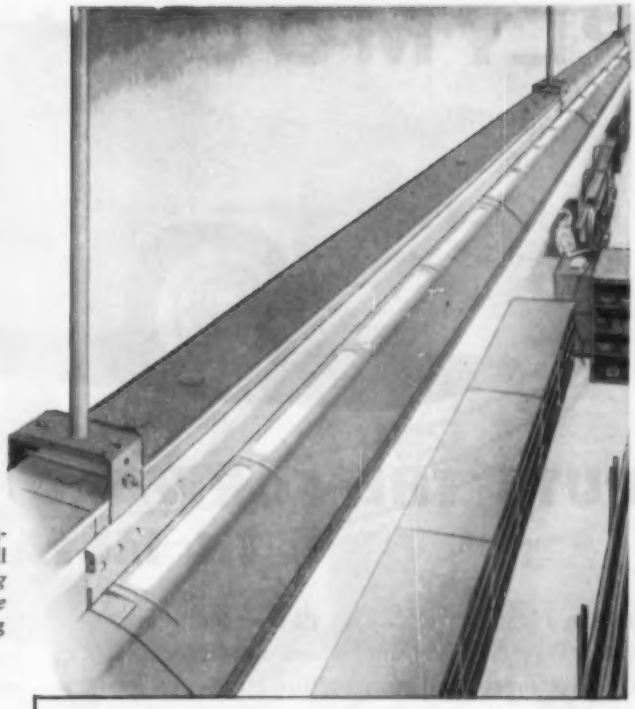
Why the Sylvania

DIAMOND-I

LIGHTING FIXTURE

is a plant engineer's best friend

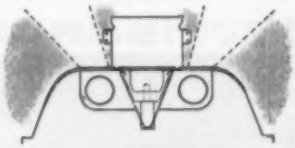


Better Plant Illumination

Sylvania's exciting new semi-direct fixture is taking industry by storm! Enlarged reflector slots release a full 25% of its light upward. *Result: More light on the ceiling . . . reduced contrasts overhead . . . less shadow and glare on work surfaces below!* Optimum 30° crosswise shielding protects eyes from direct glare of lamps.

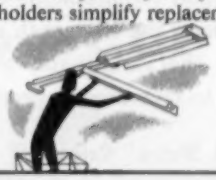
Maximum Lighting Efficiency

By unleashing more light upward which would normally be "trapped" between lamp and reflector, the *Diamond-I delivers an extremely high 89% lighting efficiency!* More light on the job means better seeing and working conditions, better morale, better quality and rates of production.



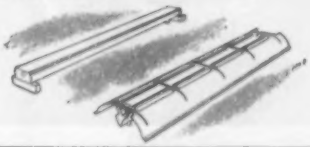
One-Man Maintenance

With 4-foot reflector-shields on both 4- and 8-foot units, one man can do it all alone! Reflector-shield is lightweight, easy to handle . . . secured to channel assembly using 2 captive bolts which can't drop out. Slots in reflector induce upward heat draft which helps carry away dust particles. Multi-socket lampholders simplify replacement.



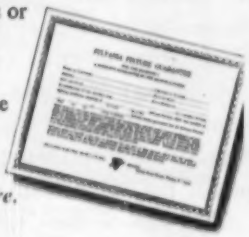
Quick and Easy to Install

Simply install the one-piece channel assembly, then fasten on the reflector-shield unit by its 2 captive bolts. Sufficient knockouts and slots in the channel assembly will accommodate all basic installation methods. Full-length grooves enable you to use slide-grip hangers.



2-year Guarantee—RLM approval

The Sylvania Diamond-I meets or exceeds all new RLM specs! Here's the industrial fixture of tomorrow, ready to be put to work for you *now*. What's more *—a replacement guarantee protects you against defective materials and workmanship for 2 years from date of manufacture.*



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PLYMOUTH

1956 Plymouth Belvedere Four-Door Sedan

PUTS THE *FORWARD LOOK* IN METAL FINISHING

In the Plymouth Division's all new multi-million-dollar V-8 engine plant, where new concepts of quality control and manufacture have been incorporated, a Frederic B. Stevens, Inc., automatic "Little Steve" machine has been installed for tin immersion plating of pistons.

Plymouth's "Little Steve" is also equipped with automatic load and unload devices and can easily handle the production requirements of 1,600 pistons per hour. In fact, the Plymouth machine has been designed so that additional arms can be added at any time to increase the production rate.

"Little Steve" Pays Off

"Little Steve" is a recent development of Frederic B. Stevens, Inc. It is a space-saving, low-cost automatic plating and/or immersion processing machine using arms (as shown in the Plymouth installation) or racks which are placed on the arms. When racks of small parts are used it is capable of processing or plating up to 40,000 pieces per eight hour day.

The size of the "Little Steve" makes for easy installation in most plants. It offers no floor overload or ceiling height problems. Furthermore, it fits in most factory bays between structural members. Small over-all size and smaller tank size means low solution expense. The capital investment is low, too – low enough to enable many companies to now have their own automatic installation.

If you would like further information about "Little Steve" write today to Frederic B. Stevens, Inc., Detroit 16, Michigan, or call your local Stevens Sales Engineer.

"Little Steve" automatic machine for immersion tin plating at the new Plymouth V-8 engine plant.

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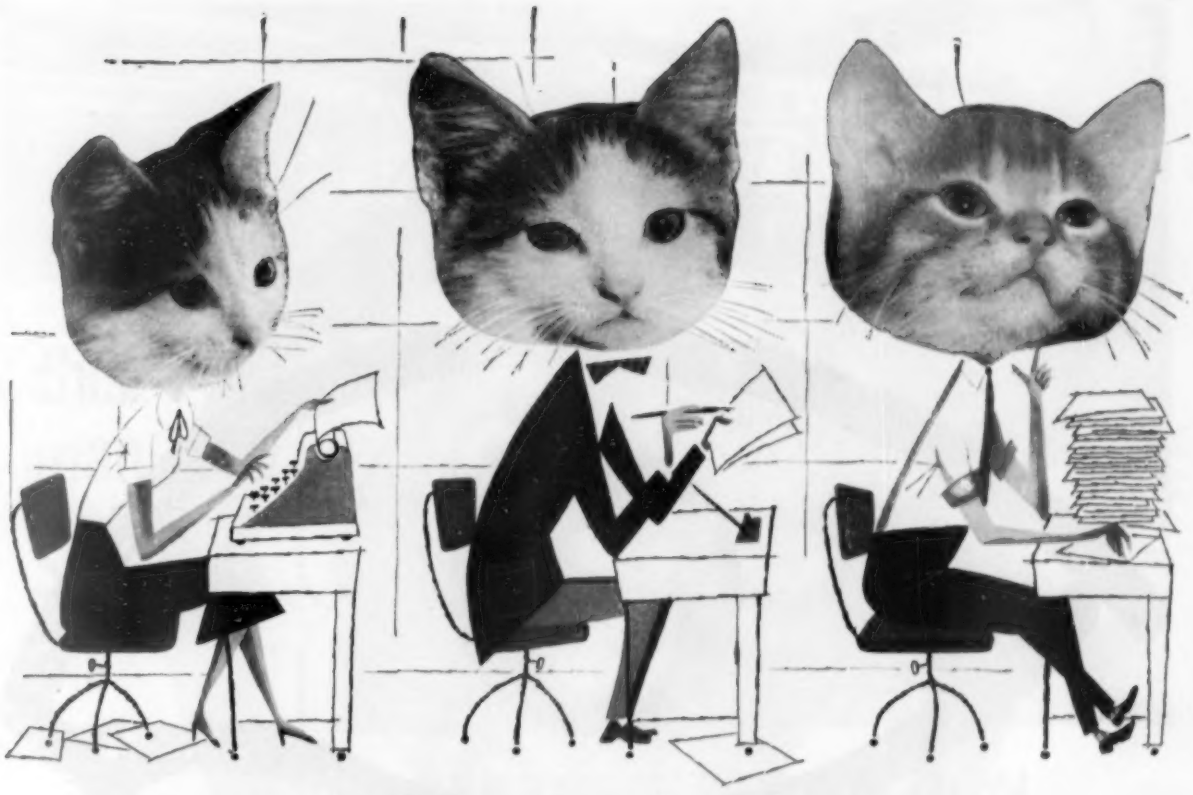

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A tremendous amount of daily paperwork in your company calls for the transfer of the same basic information from one departmental form to another. Done manually by "copy cats," this transcription is costly, slow, often inaccurate.

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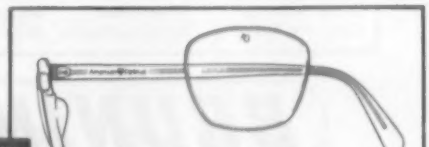
Eye accidents cost more than $5.00 per employed worker . . . with compensation *alone* running into four and even five figures for serious injury involving partial or complete loss of vision.

AO's new safety glasses, the greatest advance in years in eye protection, will help you reduce these costs. These glasses are newly designed and engineered . . . with greater protection than ever . . . greater field of vision . . . greater wearer appeal . . . many new features. Ask your Safety Director.



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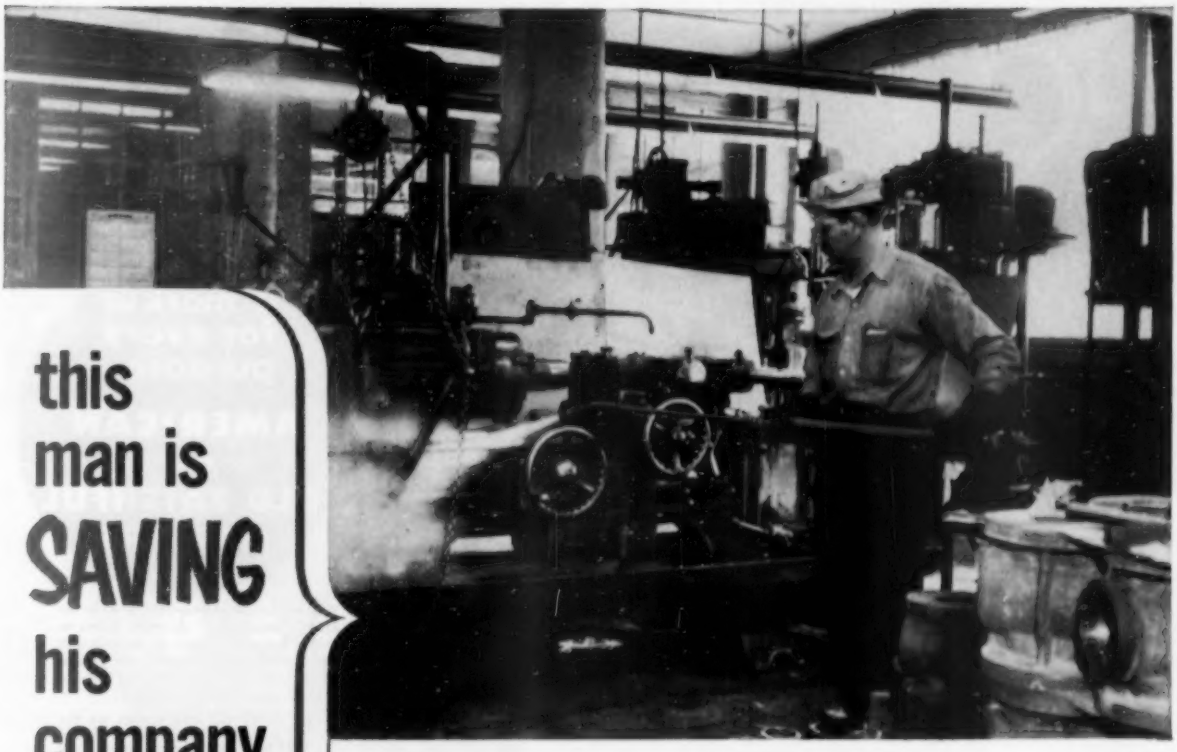

this man is SAVING his company money...

SPEEDING PRODUCTION

He's stripping oily grime from machine tools with Hypressure Jenny *before repairs or repainting.* He's *saving his company* money, because he is doing the job in one-sixth of the time taken by hand methods. Also it is a known fact that when mechanics work on clean equipment, unhampered by grease and grime, production steps up . . . job time is shortened . . . costs are reduced.

But that's only half of it!

Besides cleaning all types of production machinery, tools and equipment, Jenny saves up to 90% of the time and labor costs of cleaning floors, walls, windows, and lavatories . . . reduces fire hazard; increases plant safety; and speeds production through better working conditions.

If you would like to know more about HYPRESSURE JENNY STEAM CLEANER and the many ways it can save your company money . . .

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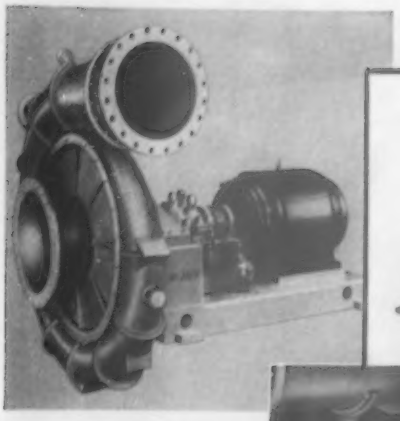

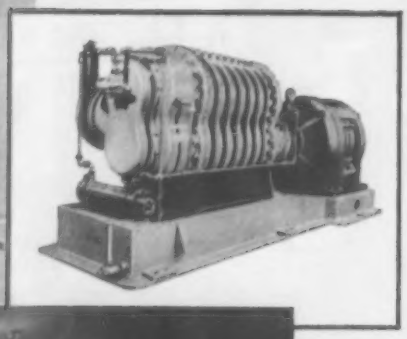

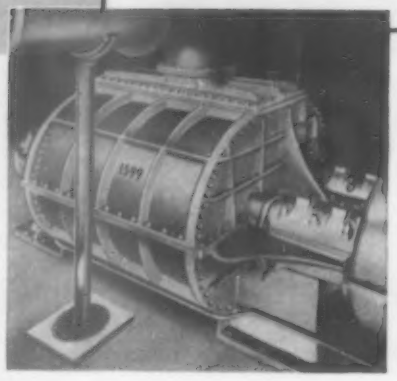

- *Above:* R-C Centrifugal Exhausters, in capacities up to 100,000 cfm.
- *Upper right:* R-C Spiraxial Compressors, from 700 cfm to 5,000 cfm.
- *Right:* R-C Rotary Positive Blowers, sized from 5 cfm to 50,000 cfm.

R-C *plur-ability* PAYS DIVIDENDS WHEN MOVING AIR OR GAS

Where quantity and quality of production depend upon the reliable, economical performance of blowers, exhausters and related equipment, look to the values of *R-C plur-ability.*

- choice of centrifugal, rotary positive and Spiraxial® types, an exclusive advantage of Roots-Connersville.
- accurate control of volume and pressure.
- ample choice of capacities, from 5 cfm to 100,000 cfm.
- high efficiencies and low operating costs.
- low down-time and maintenance expense.
- long-time durability.

All these factors add up to *R-C plur-ability.* They work for you in machines which you buy for your own use, or for resale with your equipment, where handling gas or air at moderate pressures is required. Our engineering experience and ability are at your service.

You'll find R-C plur-ability in all these products

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Spiraxial® Compressors

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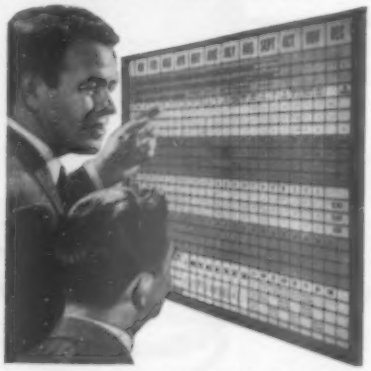

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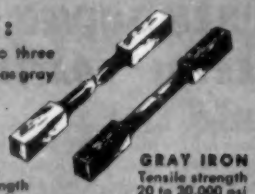
FACTS THAT FIGURE in lower costs

FACT:
Steel is two to three times as strong as gray iron.



STEEL
Tensile strength
61,800 psi

GRAY IRON
Tensile strength
20 to 30,000 psi

FACT:
Steel is two and one half times as rigid as gray iron.

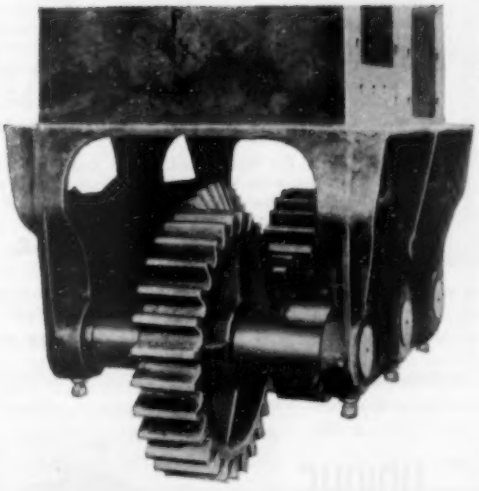
STEEL

GRAY IRON

FACT:
Steel costs only a third as much as gray iron.

STEEL GRAY IRON

AND SO... *by manufacturing your products from welded steel, costs can be reduced up to 50%.*



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Cost $664.33

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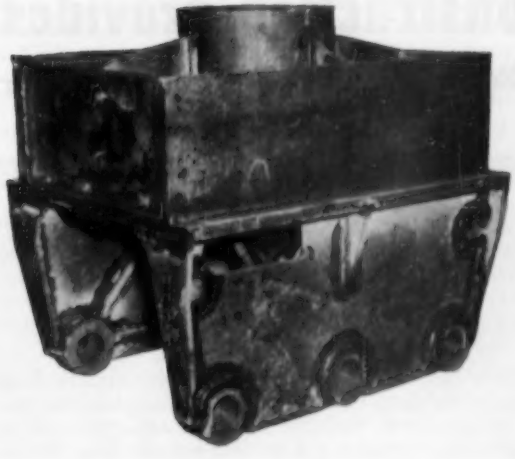
Cost $378.34



DESIGN FOR WELDED STEEL saves 43% on cost

THIS manufacturer now realizes a saving of $285.99 on every transmission housing. The 43% reduction in shop cost results from savings in both material cost and machining. Fewer pounds of metal are needed for the welded design. Cost per pound has been cut from 25¢ to 10¢ per pound.

Substantial reductions in cost like these can be made on many of your machine parts by proper use of welded steel construction. A Lincoln welding engineer will gladly study your designs . . . show where and how savings in material and manufacturing can be made. Write us.

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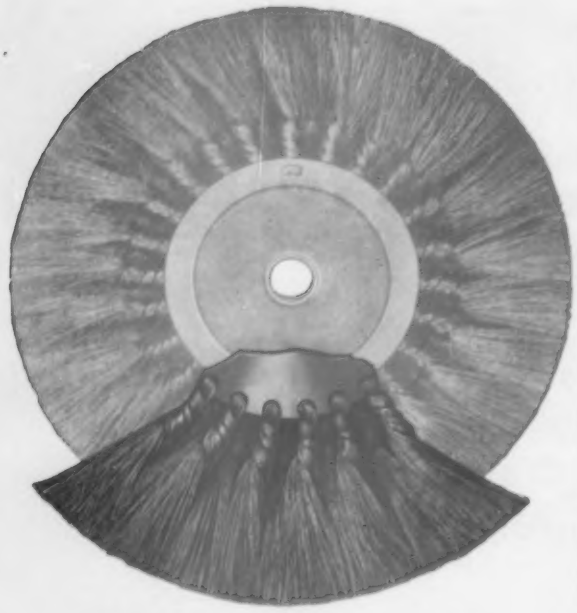
The World's Largest Manufacturer of Arc Welding Equipment



How Pittsburgh knotted brush construction provides

- *Better Balance*
- *Uniform wear*
- *Better cleaning*
- *Longer equipment life*

Because of their construction, Pittsburgh "Lightning" knotted sections have *exactly the same number of wires in every knot.* As a result, you get a brush with perfect balance—one that will wear uniformly and cause less bearing-destroying vibration in the machine that drives it!

What's more, the special type of wire used in these knots is the fastest cutting, with the longest life, that can be produced. Built for the toughest applications, "Lightning" brushes are perfect for cleaning welds, removing scale or rubber, or cleaning parts where penetration brushing is needed.

This is just one example of superior Pittsburgh construction, engineered for both general and specific applications. For details of the complete line, write for free Catalog No. 54-W. Address: PITTSBURGH PLATE GLASS CO., *Brush Division,* Dept. P-11, 3221 Frederick Ave., Baltimore 29, Maryland.

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CELANESE CORPORATION OF AMERICA PROBLEM SOLVED WITH *INERTOL® COATINGS*

● Alum solution in the concrete tanks at Water Filter Plant, Celanese Corporation, Belvidere, New Jersey, was eating through the concrete and loosening the mortar in the brick wall behind the tanks. Celanese engineers consulted Inertol Co., Inc. The tanks have been protected with Inertol coatings for over a year now—and the problem is *licked!* No more leakage. Tanks have sure, long-term protection. Maintenance has been greatly simplified.

Inertol makes a full line of industrial paints. Each one of these coatings is formulated to maintain a specific surface—to solve a tough problem. Inertol coatings can help cut your maintenance costs. The coatings the Celanese Corporation used may be the answer to your painting problems—or perhaps Inertol FLORWEAR® is just the floor coating you're looking for. FLORWEAR is designed especially for concrete floors that take a beating from chemical fumes. It's rubber-based—chemical- and wear-resistant. Won't water-spot. Comes in four colors: light gray, medium gray, dark gray, deep red.

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- NO ELECTRICAL HAZARDS

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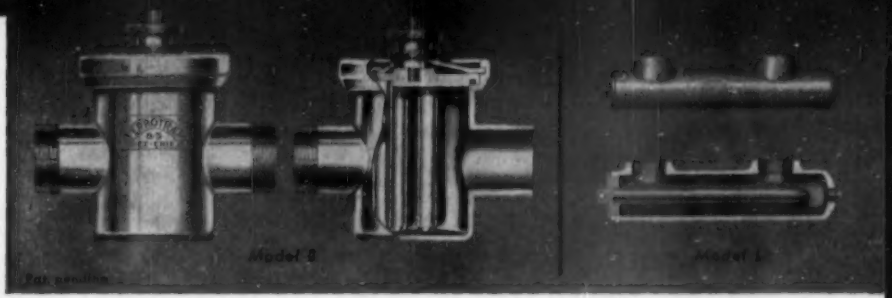
IRON contamination in LIQUIDS and DRY materials eliminated by New ERIEZ MAGNETIC SEPARATORS

New – Eriez Permanent Magnetic FERROTRAPS for *Liquids!*

Offer 300%-400% More Magnetic Working Area Than Many Old-Style Magnetic Traps

The new line of Eriez Magnetic Ferrotraps (Pipeline Traps) offer manufacturers protection against damaging fine and tramp iron contamination like they've never had before! Designed for efficient removal of unwanted iron and fines from almost all types of liquids flowing through pipelines, Ferrotraps protect costly screens, pumps, mixers, etc., and prevent ferrous contamination of the product. They are invaluable where product purity is of prime importance, in such applications as foods, drugs, beverages, chemicals, cosmetics, paints, etc.



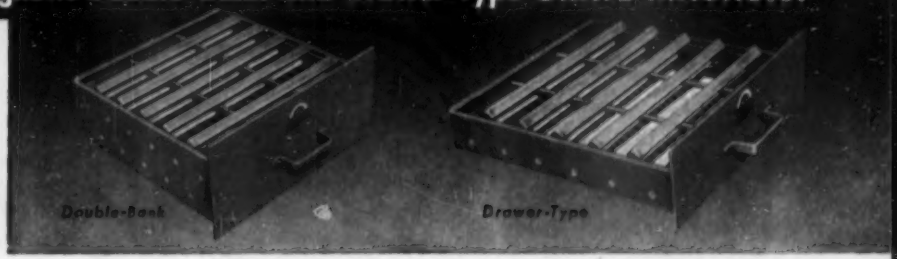
Quickly installed in any position in new or existing equipment, Ferrotraps magnetic strength is guaranteed indefinitely. Powerful magnetic unit is easily removed and cleaned; no muss, no small parts to lose. Model B, all stainless steel construction, has been built for standard or sanitary applications and is available for 2", 3" and 4" pipelines. Magnetic element consists of multiple fingers, positioned so that the flow of liquid impinges against it. Model B offers utmost protection, while Model L, with one long magnetic element (all-bronze housing), provides good protection at low cost. Model L is adaptable to pipelines from ½" to 2". Both models withstand pressure of 150 psi.

For complete information about both models, request Bulletin B-605.

New – Eriez Permanent Magnetic Double-Bank and Drawer-Type GRATE MAGNETS!

For Free-Flowing Choke and Surge Fed DRY Materials

Designed for removing tramp iron and fines from free-flowing dry materials such as grains, coffee, dried fruits and foods, tobacco, pelleted products, etc., Eriez Grate Magnets now are available in single or double-bank units in wing and drawer types. In double-bank unit, second row of magnetic tubes is placed directly under open spaces of top row for increased efficiency. Protective iron grill guides flow of material onto powerful magnetic tubes. For use in floor openings, regular or odd-shaped hoppers, chutes and ducts. Intensive magnetic barrier does excellent job of removing iron contamination.



For installation in vertical *closed* chutes and ducts, Eriez Drawer-Type Grate Magnets offer highly efficient protection plus roll-out convenience. Single or double-bank units. Entire separator glides out on metal slides for quick, easy cleaning. Installation is fast and simple . . . latch (furnished) and gasket make dust-tight installation.

Eriez Grate Magnets, wing-type and drawer-type, come in 162 sizes, from 2½" x 4", to 36½" x 36". Special sizes made to order. Complete line is available in all-stainless steel construction. For additional information, request Bulletin B-214.

NOT NAILED TO THE FLOOR! Here's an idea for publicity men who used to create "gag shots" by nailing down shoes. Just use a piece of iron on the heel of the shoe and an Eriez magnet under the rug. To industrialists, however, this demonstrates another idea — powerful magnetic action which can quickly be put to work pulling dangerous tramp iron out of processing lines . . . tramp iron which causes fires, machinery damage and product contamination. *All Eriez Magnets are non-electric, self-contained. They operate without wires or attachments. Best of all their magnetic power lasts a lifetime. The first cost is the last.*

● ***Eriez' free booklet "Magnetic Ideas" can help you. Send for it without obligation.***
ERIEZ MANUFACTURING COMPANY, 70Y Magnet Drive, Erie, Pa.
OR on your specific request Eriez factory-trained field men backed by Eriez' laboratory and engineering know-how, will be happy to study your particular problem, make a plant survey and offer helpful "Magnetic Ideas."

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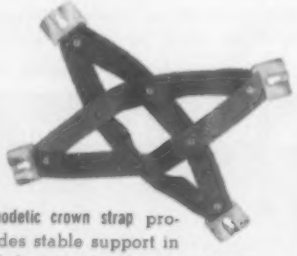
HATS HAVE THAT NO OTHER SAFETY HAT HAS!

It takes more than a strong, tough hat shell to provide full head protection—*both external and internal!* Only Willson Super-Tough® Hats and Caps give you that *extra* protection!

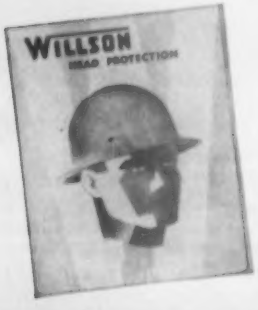
And that *extra* protection and wearer comfort is possible because of this unique, patented geodetic crown strap and pneumatic head band, developed by Cornell Aeronautical Laboratory, Inc.

Get the complete story on this new, revolutionary, scientific advance in head protection. Write for this new manual and catalog on head protection.

Super-Tough® hat cut away to show how the patented head gear fully cradles the head.



Geodetic crown strap provides stable support in all directions with no concentration of load in tie string on top of the head.



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Tells exactly what to do

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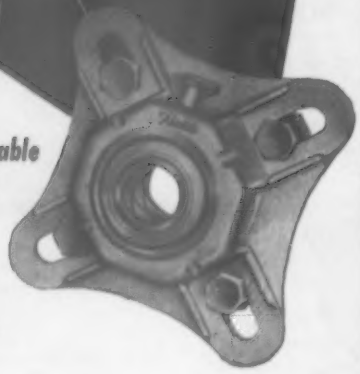
NEW Randall LOW COST 4-BOLT FLANGE UNIT



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Randall's new 4-bolt flange is readily interchangeable with any unit having bolt hole centers from 2⅛" to 2¾". It's ideal for heavy duty application on farm implements, conveyors, textile machinery, air moving equipment, packaging machinery and other similar type equipment.

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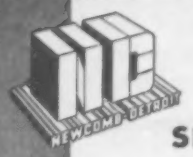

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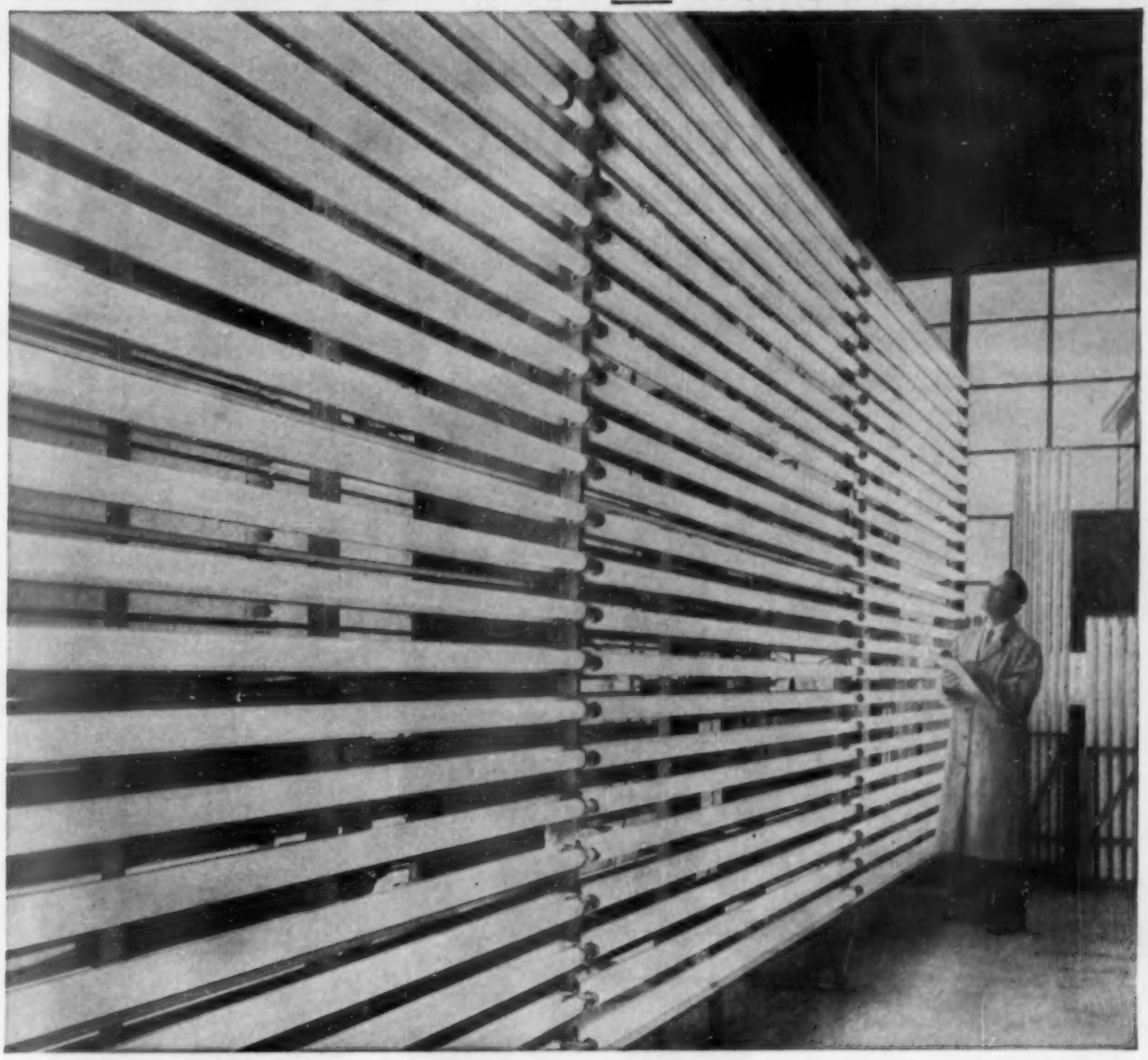

How uniform life, light output and freedom from defects in G-E lamps save you money

ELECTRICITY and maintenance labor take 90% of the money you spend for lighting—only 10% goes for lamps. To save on these two big items, you need uniform lamp performance. Uniformity of General Electric lamps is proved by the results of tests on hundreds of thousands of G-E lamps each year.

The above photo shows the life test. The results of this test, like those of hundreds of other tests, checks and inspections are checked and verified by an independent testing laboratory. To the lamp user, this means:

UNIFORM LIFE—You save time, trouble and money. 99 out of 100 General Electric 40-watt fluorescent lamps will last more than a year in single-shift plants (2500 hours service)! 96 out of 100 will still be in service after a year's service in double-shift plants (4000 hours service)!

UNIFORM LIGHT OUTPUT—You get all the light you pay for. Less than 1% of all G-E 40-watt fluorescent lamps are as much as 5% below the published rating of 2500 lumens. And for the past 18 months, these lamps have averaged 39 watts. That's 64 lumens per watt!

UNIFORM FREEDOM FROM DEFECTS—You cut maintenance costs. 99.9% of General Electric 40-watt fluorescent lamps are free from all defects that could affect performance in service.

For more facts on how General Electric gives you more for *all* your lighting dollars, write for the free 16-page Progress Report to Lamp Users: Large Lamp Department, General Electric, Dept. 482 FM-11, Nela Park, Cleveland 12, Ohio.

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Ultrasonic News

AUTOMATIC INSPECTION AND CONTROL ON CONTINUOUS PRODUCTION LINE

Continuous inspection of steel tubing and strip at production speeds is now an accomplished fact with the new Sperry Ultrasonic Reflectoscope® and RA attachment. This unit scans material traveling at high speeds and registers the presence of both internal and surface defects. Far more thorough than the human eye, it provides for both defect recording and signaling in addition to continuous inspection. Designed to incorporate signal lights or alarm bells, as well as automatic marking and machine cut-off units, the Sperry Reflectoscope and RA attachment is a flexible, accurate instrument which opens a new area to more effective cost-cutting quality control.

ELECTRONIC PROTECTRON SENSES OVERLOADS— MINIMIZES PRESS DAMAGE

A punch press attachment, which detects the slightest overloads caused by pile-ups, misfeeds, tool dullness, misalignment, the Sperry Protectron® minimizes tool and die damage by warning signals and actuation of control devices. The Protectron also cuts costly equipment damage and keeps all automatic machines running without close attention. With Protectron on guard, one man can safely and easily operate several machines at once.

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Burns Wet or Dry Refuse

Model C-10 with Guillotine feed door

Hundreds of satisfied users tell us the Wincinator saves refuse-hauling charges . . . pays for itself in less than a year. Burns wet and dry refuse. Can be installed indoors or out, takes up little space. Choice of fuels. No fuel needed for dry refuse. Oversize feed doors accept large crates and boxes.

Grates are heavy gray-iron castings. Combustion chamber is lined with heavy refractories that withstand over 2500° F. Shell is heavy galvanized steel. Optional equipment includes automatic fuel control, prefab chimney, etc.

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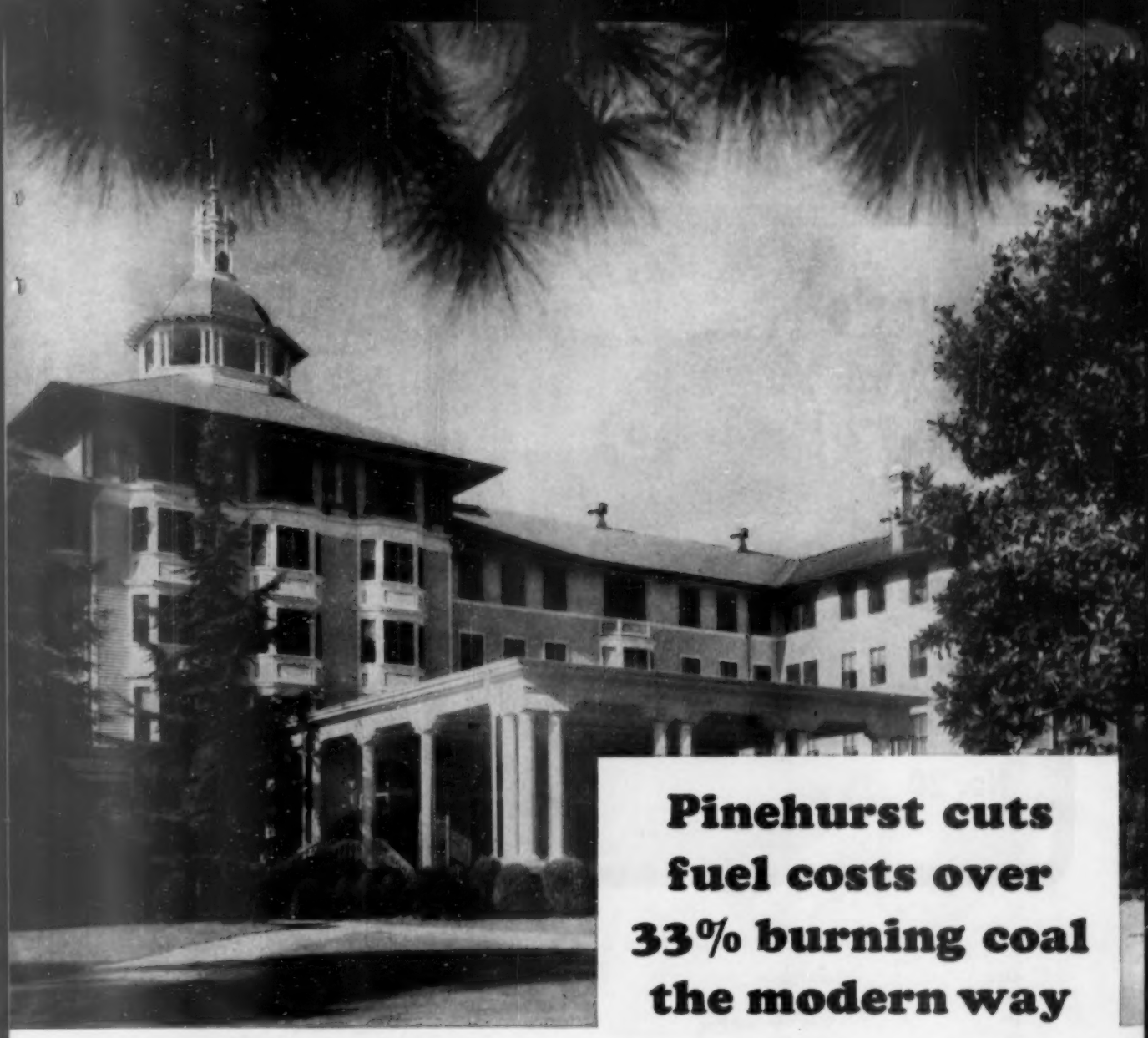

Pinehurst cuts fuel costs over 33% burning coal the modern way

The central power plant at the famous golfing resort of Pinehurst, N.C., has to furnish a reliable supply of steam to three hotels and seven other buildings. When Pinehurst recently decided to modernize power facilities, the consulting firm of Wiley and Wilson, Richmond, Va., was called in to study the situation. Since coal cost approximately 40% less than the next cheapest fuel, the final decision called for burning coal the modern way. Today two new automatic stoker-fired boilers (only one of which is operated at a time) replace four 150-hp hand-fired boilers. Combustion control is automatic; coal and ash handling is greatly simplified. And now, according to management, "the cost of generating steam is 33.4% less than with the old plant." For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
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Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available. • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar. • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use. • No smoke or dust problems when coal is burned with modern equipment. • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

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SIZE	MATERIAL	CUTTING TIME
2"	Steel Pipe	5 Seconds
4"	Cast Iron Soil Pipe	6 Seconds
6"	Steel Pipe	40 Seconds
2"	Cold Rolled Steel	20 Seconds
4 x 4 x 3/8"	Steel Angle	12 Seconds
4"	Steel Channel	10 Seconds
2"	Galvanized Pipe	5 Seconds

CAPACITY

No. 20 with 20" wheel . . . 6" pipe; 2½" solid stock
No. 14 with 14" wheel . . . 4" pipe; 2 " solid stock

ONE MAN CAN CUT MATERIAL FOR A LARGE CREW OF MEN!

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RUPERT LE GRAND
Senior Associate Editor, *American Machinist*

Based upon earlier editions of
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1579 pp., 5⅛ x 8, 774 illus., $11.00

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80% rewritten
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Fully up-to-date
1579 pages
774 illustrations
45 big sections

The facts behind this monumental change

Think of the advances of recent years in metalworking in all its aspects—not only the normal development of better tools and techniques in an important industry, but also the further advances demanded by work on new materials and new design applications! **The growth in metalworking technology, standards, and practice has been tremendous**—faces every man in the field with a great need for new working information. To meet this urgent need, the NEW AMERICAN MACHINIST'S HANDBOOK has been created—fully abreast of today's practice—and given to you with the practical treatment and handy reference features that will make this the "bible" of the industry for many years.

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Sylvania reflector lamps combine a powerful source of illumination and efficient reflector in a single sealed-in-glass unit.

The lamp that cuts fixture maintenance to the bone

Now, here's the lamp that doesn't care how dusty—or how old—fixtures may be. It's the Sylvania R52 reflector lamp—the light bulb that supplies its own built-in reflector—does away with fixture cleaning forever! (An external reflector is necessary only to protect lamp from moisture.)

If you want to cut fixture maintenance to the bone—even in dust- and dirt-laden atmospheres—you'll do well to look into this low-cost solution.

Sylvania R52 500- or 750-watt lamps simply screw into existing mogul lamp socket—require no auxiliary equipment. Ask your Sylvania supplier about Sylvania R52 reflector lamps, today.

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Uneven load placement will not sway, tip or tilt because off-center load is evenly distributed on both springs. Variable ratio springing adjusts self to road conditions, cushions against shocks, shifting loads, sudden starts and stops. The deflection rate changes automatically to produce exactly the right capacity to properly balance spring tension with the load. Load on springs does *not* increase in direct proportion to increase in load . . . spring leverage merely decreases. Only four bolts to mount . . . no assembly required. Mount with a wrench in a few minutes. Just two friction bearings with renewable friction inserts control spring action . . . assure minimum maintenance and long life.

COMPLETE LINE CONVENTIONAL AXLES . . . DROP, STRAIGHT

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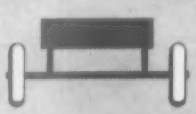
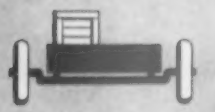
FROM THE END

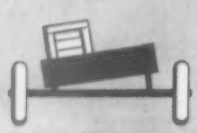
Light load finds both spindle arms parallel to trailer body, even if load is off-center.



Light load finds springs curved way up, holding trailer body in high, easy-to-tip position.



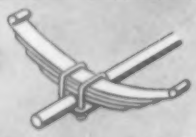
Full load finds relative position of axle and body unchanged. Both springs take load evenly.



Full load shifts from one spring to other. Off-center load causes swaying, produces dead spring.

FROM THE SIDE

Light load gets full spring action because long leverage absorbs road shocks efficiently.



Light load will ride well only on light spring like this. But this won't handle heavy load.

Full load reduces leverage, which automatically balances springs to load requirements.

Full load requires heavy spring, which can't give any spring action with light load.

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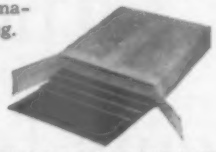

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American Blower Model K Ventura Fan

You can count on American Blower Ventura Fans to do the job they are designed for, with high efficiency and a minimum of maintenance. They are built for long life and top performance. All ratings are certified.

American Blower Model K Ventura Fans are ruggedly constructed, heavy-duty propeller fans for tough industrial applications. They offer the power you need . . . when you need it, and will operate against static pressures up to ⅝". Request Bulletin 6514.

American Blower Ventura Fans are attractively designed, quality built, and easy to install . . . *yet competitively priced.* Ventura Fans come in a wide range of sizes and capacities — with constant-speed and two-speed direct drives, totally enclosed motors — to satisfy your exact requirements.

CERTIFIED RATINGS

Certified ratings are the result of tests made by the Manufacturer in accordance with the Standard Test Code for Centrifugal, Axial, and Propeller Fans adopted jointly by the National Association of Fan Manufacturers, Inc. and the American Society of Heating and Ventilating Engineers.

AUTHORIZED BY N A F M

© 1951 NATIONAL ASSOCIATION OF FAN MANUFACTURERS, INC.

Certified Ratings

MEMBER AFMA

Model G Ventura Fans

Model G, at left, is a sturdily built and attractive fan suitable for light industrial duty and commercial applications. It is especially quiet-operating, making it ideal for offices, stores, and lobbies — or wherever quiet operation is required. Write for your copy of Bulletin 6414, which gives complete performance data.

American Blower products serve industry

Air Conditioning, Heating, Ventilating Equipment
Mechanical Draft Equipment
Industrial Fans and Blowers
Centrifugal Compressors
Gyrol Fluid Drives
Dust Collectors

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

HERE'S A HANDY POSTCARD THAT WILL HELP YOU—

GET MORE INFORMATION

How to use this Reader Service Card . . .

The bottom of this page is a postcard—you'll note that the page has been perforated so you can tear it out easily. This postcard makes it easy for you to get more information on anything that's advertised in FACTORY, or listed in FACTORY's *Catalog News, Equipment News,* and *Materials News Sections.*

Catalog News Section: Starts on page 158. FACTORY's Editors look at scores of catalogs each month, and select those that will be most helpful to you. In the Catalog News Section of the postcard, circle the numbers corresponding to the numbers of the catalogs you want. You'll get them—without obligation—direct from the manufacturer.

Equipment News Section: Starts on page 160. Here FACTORY's Editors describe various kinds of new equipment that will help you solve plant problems. In the Equipment News Section of the postcard, circle the numbers of the items you'd like to know more about. You'll get information direct from the manufacturer—without obligation.

Materials News Section: Starts on page 298. Out of the many new materials announced each month, FACTORY's Editors pick out those most useful to you. In the Materials News Section, circle the items you want to know more about. You'll hear direct from the manufacturer—no obligation.

Advertising Section: The postcard has numbers corresponding to the page numbers of the advertisements. Circle the page numbers of those you're interested in. Where more than one advertisement is on a page, the letters L, R, T, B indicate location: left, right, top, bottom.

Then be sure: Fill out your name, address, and other information in the space provided, tear out the card, drop it in the mail. The data requested will be forwarded to you shortly.

FACTORY: Send me more information about . . . **NOVEMBER 1955**

(Good until January 31, 1956)

. . . items in the CATALOG NEWS SECTION as circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79									

. . . items in the EQUIPMENT NEWS SECTION as circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
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. . . items in the MATERIALS NEWS SECTION as circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

. . . items ADVERTISED on the pages circled below:

1	4	5	6	7	8	9	10	11	12	13	14	15	16	16a	16b	17	18	19	21	23	27
29	30	31	32	33	35	37	39	41	43	45	47	48	48a	49	51	52	53	55	57	59	60
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258	259	260	261	262	263	264	265	266	267	269	270	271	272	273	274	275	276L	276R	277	278	279
280T	280B	281	282	283	284	285	286L	286R	287	288	289	290	291	292T	292B	292R	293	294	295	296L	296R
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359	360L	360T	360B	361	362L	363	364L	364T	364B	365	366L	366B	367	368L	369	370L	370T	370B	376	Second Cover	

Third Cover Fourth Cover

TAKE ANOTHER LOOK...

...at the advertising in this FACTORY issue

...at FACTORY's Catalog News Section

...at FACTORY's Equipment News Section

...at FACTORY's Materials News Section

...and then circle on this handy postcard the items you want to know more about.

It's an easy way to get information on any subject you are interested in—you can build your own data file. And you can do it without cost.

Every month in FACTORY you can use this free service to get useful literature. And every month in FACTORY's advertising pages, leading manufacturers show you new ways, better ways to cut costs, boost production.

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FIRST CLASS
PERMIT No. 64
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NEW YORK, N. Y.

BUSINESS REPLY CARD

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4¢ — POSTAGE WILL BE PAID BY —

McGRAW-HILL PUBLISHING CO., Inc.
Reader Service Department

FACTORY Management & Maintenance

330 WEST 42nd STREET

NEW YORK 36, N. Y.

Right off your Square D Distributor's shelf!

New QMB Saflex Distribution Panelboard

Exactly the Power Panelboard you want—when you want it. Your Square D Distributor stocks boxes, interiors and plug-in units which can be quickly assembled to meet virtually any specifications. Above, interior ready for easy mounting in box.

Plug-in Units are installed easily on tubular bus bars. The solid neutral can be changed in minutes. Here is flexibility that reduces "down time" and saves money.

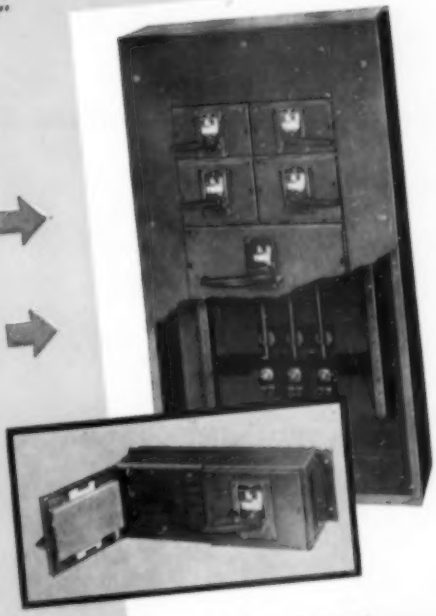
Three Simple Assembly Steps Fronts, with adjustable trim clamps, are available with or without doors.

With ALL these Quality Features

INTERIORS are flexible and adaptable to almost any service and voltage. Plug-in units and solid neutral can be changed simply and quickly.

BOXES provide generous wiring space.
FRONTS furnished with or without doors have adjustable trim clamps.

UNITS have quick-make, quick-break switch mechanism, visible blades and are horsepower rated. 30, 60, 100 and 200 ampere units are plug-in, while 400 and 600 ampere units are bolted to the bus.



•*Underwriters' Approved for Service Entrance*

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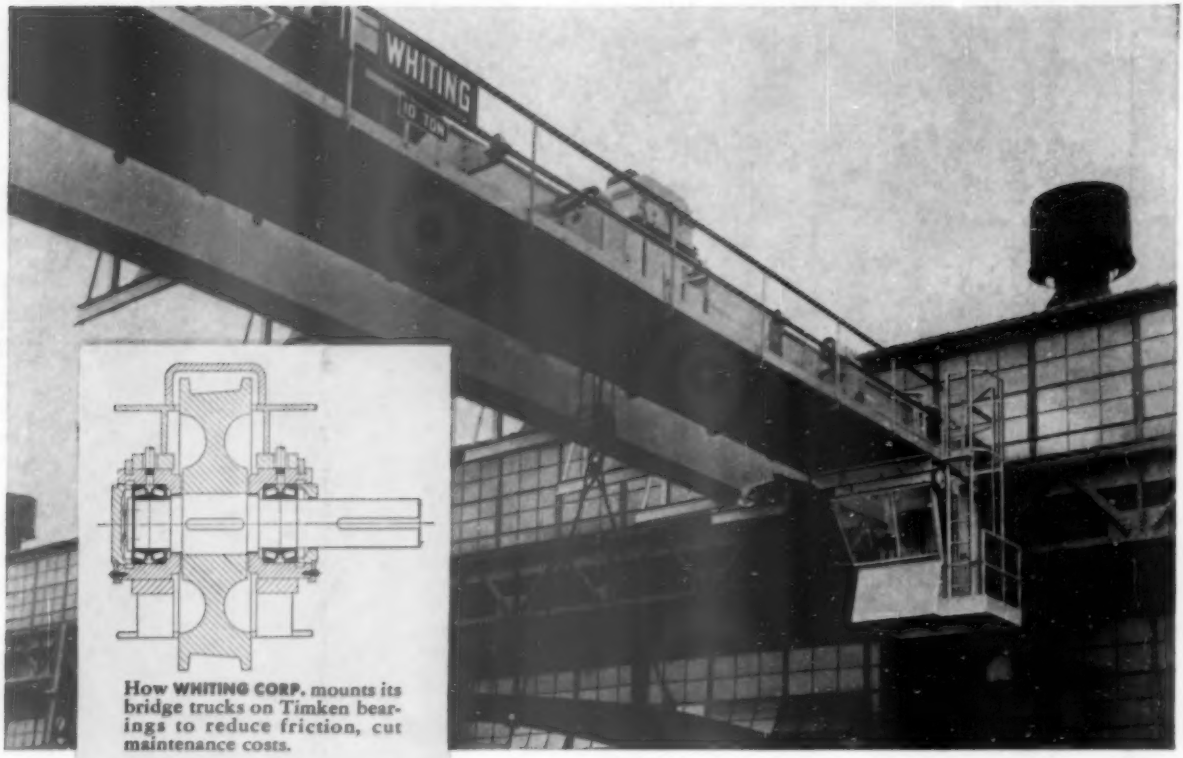
SQUARE D COMPANY



How **WHITING CORP.** mounts its bridge trucks on Timken bearings to reduce friction, cut maintenance costs.

Why Whiting switched to TIMKEN® bearings for its traveling cranes

THIS ten-ton capacity overhead traveling crane, like all other heavy-duty Whiting cranes, uses Timken® tapered roller bearings to keep it traveling. Timken bearings now are used in the bridge trucks of Whiting cranes because they can take the heavy thrust loads by themselves and perform better with less maintenance.

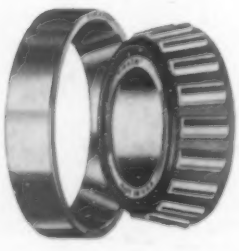
Timken tapered roller bearings take *both* radial and thrust loads in any combination without the conventional thrust collar which Whiting previously needed for this type of overhead crane. Timken bearings practically eliminate friction because they are geometrically designed to have true rolling motion and are made microscopically accurate to conform to their design.

Because Timken tapered roller bearings reduce friction to a minimum and make possible the handling of larger thrust loads, maintenance is lower and production is higher.

We make our own steel to insure highest bearing quality. We're America's only bearing manufacturer that does. And we make it nickel-rich for added toughness.

Whiting Corporation knows that Timken bearings help their cranes do a better job. No wonder they have changed over 100% to Timken bearings on their bridge trucks. Whether you build or buy machinery, make sure it has Timken bearings. Look for the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

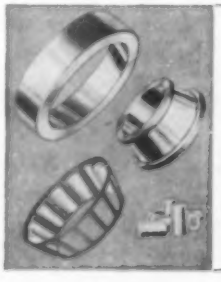
This symbol on a product means its bearings are the best.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. nickel-rich Timken alloy steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◐ AND THRUST →◐← LOADS OR ANY COMBINATION ✳